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Individual and Contextual Factors Involved in School-Age Children's Self-Serving Dishonest Behavior in Competitive Settings

PH.D. THESIS

PhD candidate: Narcisa - Gabriela Prodan

Scientific Supervisor: Prof. dr. Habil. Laura Visu-Petra

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TOPAN MIHAELA
2023.10.16 13:33

TABLE OF CONTENT

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TOPAN MIHAELA
2023.10.16 13:33

CHAPTER 1. THEORETICAL FRAMEWORK

1.1. Introduction and Motivation

Oh, what a tangled web we weave...when first we practice to deceive.

Walter Scott (Marmion)

Honesty is one of society's core values (Bok, 1978), considered by scholars and laypersons as our default response when interacting with others (Buller & Burgoon, 1996; Levine, 2014). Nevertheless, its opposite - dishonesty, is viewed as a pervasive behavior occurring virtually in all contexts, manifesting as the disposition to conceal, deceive, or cheat. People can choose to be dishonest for various reasons, ranging from self- (e.g., avoiding negative consequences, gaining advantages, or self-concept maintenance) to others-oriented purposes (e.g., protecting others, being polite) that are associated with adaptive evolutionary processes (Bond & Robinson, 1988). Irrespective of its motivations or evolutionary roots, dishonesty was often viewed as a threat to the "moral fabric of society" (Bok, 1978) and a predictor of dire outcomes (Stouthamer-Loeber & Loeber, 1986).

Given its detrimental consequences, the majority of studies have looked at human dishonesty and its structural features, trying to answer questions like "What are the behavioral cues of dishonesty?" or "How good are people at detecting the cues associated with dishonest behavior?" (Levine, 2022; Sternglanz et al., 2019). To this end, individuals' dishonesty and its context have been experimentally manipulated (i.e., used as *independent variables*) to determine their effects on deception detection (DePaulo et al., 1983). Nevertheless, a growing body of evidence suggests that no "Pinocchio's growing nose" is associated with people's dishonest behavior and that cues to deception are highly variable across individuals (Brennen & Magnussen, 2020; Luke, 2019; Nortje & Tredoux, 2019).

Before addressing such questions regarding the traces of dishonesty and how they can be best detected, one may wonder how we end up acting dishonestly and what drives this kind of behavior early on. Generally, to understand adult behavioral tendencies, a growing body of literature focuses on children's behavior to disentangle the innate and socialization factors, which also applies to dishonesty research (Ding & Lee, 2020; Lee, 2013; Talwar & Crossman, 2011). Studying dishonesty among children may provide scholars with a more comprehensive image as children proved to be less sensitive to social routines and, thus, less inhibited in certain circumstances (e.g., Rakoczy & Schmidt, 2013; Runco & Cayirdag, 2012).

Consequently, the developmental literature focused on dishonesty and its structural features as *outcome variables*, looking at what drives children's propensity and proficiency to mislead others or conceal information. For instance, researchers manipulated the motivational context (Carl & Bussey, 2019, 2022) or other features, such as the recipient's characteristics (Talwar et al., 2004), to test children's decision to be dishonest. With that, scholars discovered that children's dishonesty represents a unique window to their socio-cognitive (Lee & Imuta, 2021; Sai et al., 2021; Talwar & Lee, 2008; Talwar & Crossman, 2011) and moral development (Carl & Bussey, 2022; Evans & Lee, 2022; Popliger et al., 2011). This paradigm switch allowed dishonesty to be perceived as a ***normative behavior*** across childhood and a developmental hallmark of children's socio-cognitive sophistication. Furthermore, understanding children's increasing ability to act dishonestly and its socio-cognitive precursors can aid practitioners in determining children's competence to testify in legal contexts where the information they provide has crucial implications (e.g., cases of sexual abuse in which the child becomes the only source of relevant information; Bala et al., 2000; Talwar & Crossman, 2012; Talwar et al., 2002).

The seminal approaches addressing the mechanisms of human dishonesty focused on the socio-cognitive processes involved when someone is trying to cheat, lie, or mislead others. Research showed that ***basic cognitive functions***, such as *processing speed* or *short-term memory*, allow individuals to swiftly adapt when dishonesty is needed (Debey et al., 2015; Visu-Petra et al., 2016). Furthermore, truth-default theories (e.g., Spence, 2004) posit that dishonesty automatically involves suppressing the truth, monitoring one's behavior, and planning the next moves while juggling multiple pieces of information to ensure consistency. All these cognitively demanding processes are enabled by the development of ***executive functions (EFs)***. EFs are an umbrella concept encompassing multiple processes that support our capacity to plan and meet goals (*planning*), inhibit prepotent responses (*inhibitory control*), handle multiple information at once (*working memory*), and alternate between them smoothly (*cognitive flexibility*; Diamond, 2013). Previous literature demonstrated that children's increasing complexity in misleading others is significantly associated with their executive functioning (Sai et al., 2021).

Whenever we act dishonestly, we try to achieve something in relation to others, making it an inherently social behavior. In order to succeed in their dishonest endeavors, one must fully understand the social contexts and others' mental states (e.g., desires, intentions, emotions), which supports the association with social cognition processes, such as ***theory of mind*** (ToM; Talwar & Lee, 2008; Walczyk et al., 2014; Walczyk & Fargerson, 2019). ToM represents the socio-cognitive ability to understand others' intentions, emotions, or desires and to predict someone's behavior based on these evaluations (Miller, 2022; Wellman, 2001). Before deciding to be dishonest, individuals must carefully assess the recipient's knowledge access and intentions and realize they can manipulate the recipient's mental state (Talwar & Crossman, 2011). Developmental science provided well-documented evidence on the parallel progression of children's early abilities to act dishonestly and ToM's emergence (Ding et al., 2015; Lee & Imuta, 2021; Sai et al., 2021; Walczyk & Fargerson, 2019). Nevertheless, less is known about how this parallel progression goes beyond preschool years when more advanced forms of ToM develop (Miller, 2022; Moldovan et al., 2020; Weimer et al., 2017).

Whereas socio-cognitive development can foster children's increasing ability to conceal something or mislead, other individual factors can hinder it. For instance, children with ***internalizing problems*** (e.g., OCD symptoms) proved less accurate when asked to keep a secret to spare others' feelings (Visu-Petra et al., 2016). In terms of its frequency, other findings suggest that adolescents with depressive symptoms reported higher levels of dishonesty toward their parents (Laird & Marrero, 2010; Lavoie et al., 2017), which can, in turn, limit their access to professional help (Wisdom et al., 2006). Therefore, detangling the associations between internalizing symptoms, such as anxiety or depression, that are increasingly reported in children (Mullen, 2018; Polanczyk et al., 2015) and their dishonest behavior is also essential for clinical settings.

Children's dishonest abilities emerge due to increasingly sophisticated socio-cognitive skills and are further shaped by their emotional development (Dykstra et al., 2023; Talwar & Crossman, 2011). However, their motivation to employ such strategies and the process of learning when it is appropriate to be dishonest is mainly influenced by socialization (Talwar & Crossman, 2022; Talwar et al., 2022). Caregivers (e.g., parents) are the primary social agents early on, and they can significantly impact how children understand and (when they) practice dishonesty. Their influence can be exercised either explicitly, through specific messages about the importance of honesty, or implicitly, through ***parental practices*** (e.g., *emotional warmth, rejection, controlling behaviors*) that can affect children's propensity and proficiency to be dishonest in different extents across development (Talwar & Crossman, 2022). Research suggests that harsh or controlling parental practices foster children's dishonesty as they seek to avoid punishments or controlling parental tendencies (Stouthamer-Loeber, 1986; Talwar, Lavoie, et al., 2017). In turn, other parental practices, such as warmth-related behaviors, reinforce children's honesty (Baudat et al., 2022; Talwar & Crossman, 2011) or other dishonest acts aimed at protecting others (e.g., prosocial lie-telling; Popliger et al., 2011).

While addressing various types of dishonest acts in children (secrecy, cheating, or lie-telling), the existing literature mainly focused on the child-adult dyad, thus neglecting the dynamics imposed by ***peer relationships***, which could change school-age children's needs and motivations and reinforce dishonesty (Dykstra et al., 2020a). The existing evidence on children's dishonesty toward peers is rather indirect, focusing on their evaluations of lie-telling toward friends (Lavoie & Talwar, 2022; Perkins & Turiel, 2007) or their self-reported frequency of lying to them (Dykstra et al., 2020a). To our knowledge, virtually no experimental evidence shows children's propensity to employ dishonest strategies toward familiar and unfamiliar peers in competitive settings.

Lastly, other contextual forces besides social agents can indirectly shape children's propensity and proficiency to be dishonest. Factors such as ***socioeconomic status*** or ***bilingual education*** received little (to no) attention in the literature despite their recognized associations with children's socio-cognitive development (Bialystok, 2018; Letourneau et al., 2013). Whereas for bilingual education, we have no previous literature addressing its association with children's dishonesty, socioeconomic status investigations yielded mixed results, being either negatively or non-significantly associated with children's dishonesty (Stouthamer-Loeber & Loeber, 1986; Tijenssen et al., 2017). These results can be attributed to the high variability in measuring SES (e.g., parental education, income, living conditions, or other composite scores) and the indirect effects it could have on other factors, such as parental practices or educational environment (Talwar & Lee, 2011; Tobol & Yaniv, 2019).

In order to address these voids in the literature, the current thesis aims to assess some of the most relevant individual (e.g., *basic cognitive processes, theory of mind, executive functions, and internalizing symptoms*) and socio-environmental/contextual factors (e.g., *parental practices, peer relationships, socioeconomic status, and bilingual education*) associated with children's dishonest behaviors (*secrecy* and *lie-telling*) in experimental settings resembling real-life situations in which school-age children may decide to keep a secret or mislead others for personal gains. The findings will provide a comprehensive view of the forces shaping children's normative dishonesty through an integrative theoretical model explaining the interrelations between individual and contextual factors in predicting the development of dishonesty in middle childhood.

1.2. Research Relevance

A growing body of research has documented the paradoxical nature of dishonesty (Evans & Lee, 2022; Lee, 2013; Talwar & Crossman, 2011). The developmental paradox of dishonesty relies on its progression from a normative aspect of development at younger ages to problematic adolescent behavior if relied upon constantly, being associated with adverse socio-cognitive and emotional outcomes (Dykstra et al., 2020a, b; Stouthamer-Loeber & Loeber, 1986).

Across development, children can engage in *different types of dishonesty*, from simply concealing information (implying an absence of behavior or alteration behaviors such as distracting attention; Slepian, 2022) to fabricating statements (Talwar & Crossman, 2011). Both types of dishonesty can entail *different levels of complexity* (e.g., *concealing information* by remaining silent vs. changing the subject and distracting the interlocutor; lying by simply denying something vs. offering a detailed explanation). Due to this vast range of intricacies, dishonesty can provide a unique perspective on children's cognitive, emotional, and social development by informing researchers about their internalization of social norms and socio-cognitive skills (Ding & Lee, 2020; Talwar & Crossman, 2022). Thus, ***unraveling the mechanisms behind their dishonest behavior*** by manipulating the motivational contexts (e.g., creating games with different stakes) and the target's characteristics (e.g., familiarity) could assist parents, educators, and other practitioners in understanding their role in children's path to honesty and moral development. For example, addressing children's intentions when deceiving can inform ***moral education*** programs on emphasizing others' intentions rather than their overt behaviors when judging the rightness of someone's actions.

Despite the literature's main focus on the ***cognitive factors*** (Lee & Imuta, 2021; Sai et al., 2021), ***understanding how dishonesty is progressively socialized*** requires a ***comprehensive model*** intersecting the social, contextual, cognitive, and emotional dimensions (Talwar & Crossman, 2011). The concurrent investigation of the ***contextual factors*** associated with children's dishonesty can help address its disruptive side by ***informing prevention/intervention programs*** on how children's environment can promote the value of honesty and teach them more appropriate social strategies for achieving their goals.

Children's motivations to be dishonest become more socially oriented with increasing age. Therefore, determining the extent to which a child could be motivated to provide misleading information and their ability to do so becomes crucial in specific settings (e.g., children's testimonies; Talwar & Crossman, 2012). In time, researchers devoted their efforts to developing specific tools for detecting individuals trying to hide relevant information (Ben-Shakhar & Elaad, 2003; Verschuere et al., 2015). Nevertheless, their work was mainly directed to adults rather than children, with fewer available tools adapted for children in these settings (Visu-Petra et al., 2016). Extending these efforts in ***validating empirical tools*** that can aid practitioners in discerning between knowledgeable and unknowledgeable children in relevant contexts can highly contribute to advancing the legal field and restoring children's credibility in some situations.

This introductory chapter describes the conceptual aspects of children's dishonesty and the forms it can take in different competitive contexts (concealing information for self- or others-oriented reasons; deceiving others for personal gain by deceptive or truthful indications/pointing or providing elaborated explanations). Along with these fundamental notions, we present some of the most relevant individual (baseline cognitive processes, theory of mind, executive functions, and internalizing symptoms) and socio-environmental/contextual (parental practices, peer relationships, socioeconomic status, and bilingual education) correlates of school-age children's self-serving dishonest behavior.

1.3. Children's Dishonesty

1.3.1. Definition

In numerous studies, dishonesty refers to specific behaviors, such as lie-telling or academic cheating (e.g., Abuhammad et al., 2023; Heyman et al., 2019; Talwar & Lee, 2011). However, dishonesty is a more extensive concept, encompassing different behaviors, such as concealment (secrecy), cheating, sabotage, or fraud. The broad concept of *deception*, which includes strategies like omissions, misreporting, or fabricating statements, is also part of dishonest behaviors, even though its forms are not always evaluated as fully blunt lies (Muñoz Garcia et al., 2023). Other findings suggest that individuals are not relying solely on fabricated statements when attempting to mislead others. Instead, they may alternate between truthful and false information, especially when the target is aware of the possibility of being deceived and becomes highly suspicious (e.g., in poker games; Ding et al., 2014; Sai, Ding et al., 2018).

Recent findings on adults' dishonesty provide essential evidence for perceiving dishonesty within a continuum (a "grey scale") rather than the classic dichotomous perspective (honest/dishonest; Muñoz Garcia et al., 2023; Pascual-Ezama et al., 2020). These recent experimental paradigms of dishonesty have allowed for an individual-level analysis, contouring specific profiles. They showed that, in the same motivational context (e.g., a self-benefiting situation involving monetary rewards), some people were fully honest, whereas others chose to cheat without lying in subsequent questioning. Other individuals lied without even cheating (e.g., they chose not to roll a dice and fabricated a response to the target question about their results on rolling the dice), while others were cheating and lying (Pascual-Ezama et al., 2020). Despite using similar paradigms that allowed for studying both cheating and lying in children (e.g., the temptation resistance paradigm; Lewis et al., 1989), this individual-level of analysis was less reported in studies addressing children's self-serving, deceptive behavior.

Previous literature addressing different types of dishonesty in children demonstrated that each dishonest behavior is unique in terms of its motivations and socio-cognitive requirements. For example, children who cheat mainly seek to break a rule to gain an advantage (e.g., find the correct answers to a math test). In contrast, when they are choosing to fabricate statements, they might try to manipulate others' mental states and instill a false belief in the recipient's mind in order to avoid punishment or gain an advantage (e.g., make others believe they know the correct answers to a math test). To achieve these aims, different levels of socio-cognitive sophistication may be in place. While more rudimentary forms of ToM were positively linked to children's cheating behavior (Moldovan et al., 2020; Seucan et al., 2022), lie-telling required a more advanced form of ToM development, such as first-order ToM in the case of using simple denials to lie (e.g., *No, I did not peek at the correct answer*; Talwar & Crossman, 2011) or second-order ToM for more elaborated, detailed lies (e.g., *I know the correct answer because I watch documentaries with my parents*; Talwar et al., 2007). To fully understand the developmental trajectories of children's dishonesty, the best approach may be to investigate the different types of dishonest behaviors and their socio-cognitive and contextual correlates.

1.3.2. Types of Dishonest Behaviors in Children

1.3.2.1. Concealment (Secrecy)

Concealment, defined as withholding information without "saying anything untrue" (Ekman, 1985), is a more subtle form of dishonesty highly used by children across development. Given its lack of fabrication, it has been viewed as more accessible to employ and, thus, speculated to emerge earlier (Frank, 1992). Despite its apparent simplicity, it can have significant implications when employed by children in critical contexts, such as abuse cases (Gongola et al., 2021; Lyon & Ahern, 2011).

Some scholars used the term *secrecy* when referring to the children's use of concealment. Much like dishonesty, secrecy is ubiquitous, with 97% of people reporting having at least a secret at every moment (Slepian et al., 2017). Recent theoretical accounts argue that concealment is only one aspect of secrecy, not its outset. Slepian (2022) posited that secret-keeping would not be possible without the initial *intention* to conceal information. Therefore, rather than defining secrecy as the active concealment of sensitive information, a more comprehensive definition would be the "intention to keep information unknown from one or more others" (Slepian, 2022). Although subtle, this new definition distinguishes between two components of secrecy: *having/knowing* a secret and *keeping* a secret, which are entirely different. For example, some secrets do not require concealment because they never become the subject of social interaction. Despite intending to keep the information unknown to others, active concealment may never be necessary if the relevant context is not encountered.

However, individuals could engage in active concealment when a secret could be revealed. According to Slepian (2022), the concealment of a secret can be achieved by three related processes: monitoring, expressive inhibition, and alteration. To ensure no informational leakages, individuals must carefully *monitor* their behavior (verbal and non-verbal) and interactions (e.g., what they are communicating and how their partner is reacting). Consequently, if one detects the danger of revealing the secret while monitoring their social interactions, they will try to *inhibit* any response that may lead to that and convey a different way of communicating in order to ensure secrecy. In order to inhibit the relevant information from being disclosed, individuals may engage in *alteration behaviors*. For example, one could try changing the topic of a conversation (Sun & Slepian, 2020), ask different questions (Bitterly & Schweitzer, 2020), or choose to respond to other questions received that do not involve revealing the secret (Rogers et al., 2017). In more extreme cases, individuals could also use *deception* (fabricating statements) to ensure secrecy. However, using deception instead of other more benign alteration behaviors could have major social implications and require additional socio-cognitive skills to be successful (Visu-Petra et al., 2016).

Long-standing research demonstrated that understanding and practicing secrecy are essential for children's social development. Last and Aharoni-Etzioni (1995), for example, argued about three developmental milestones within which secrecy plays an important role: (a) self-identity, (b) relatedness, and (c) social competence. These aspects of human development are included in the "social contract" established with others when we share a secret or when others confide in their secrets. Sharing and keeping secrets is a sign of social competence, which allows for initiating and strengthening relationships (Anagnostaki et al., 2013).

As Bok (1983) stated, "we are all, in a sense, experts on secrecy. From earliest childhood, we feel its mystery and attraction". Developmental evidence showed that children's ability to understand and keep secrets typically appears from age 5 (Anagnostaki et al., 2010, 2013; Pipe & Wilson, 1994). After grasping the idea that secret information must be kept unknown from others, across school-age years and beyond, children are also starting to understand the contexts in which secrets are being shared and kept and the social dynamics involved (e.g., the level of trust in others; Lavoie et al., 2017; Watson & Valtin, 1997). School-age years bring a major change in children's lives due to the social diversification it entails and the rise of peer relationships' importance for children's overall development (Bosacki, 2021). With that, the power of secrecy also increases, becoming an essential tool for establishing and maintaining meaningful relationships with peers. Research shows that children and adolescents reported keeping approximately two secrets per day, which can mean that the overall frequency of children's secrecy tends to increase as children get old (Lavoie et al., 2017). This can be significantly associated with their socio-cognitive development (Colwell et al., 2016; Gordon et al., 2014; Lavoie & Talwar, 2020; Visu-Petra et al., 2016) and well-being (Dykstra et al., 2020a, b; Lavoie et al., 2017).

Children's decision to keep a secret may also be highly influenced by their motivations (e.g., secrets kept to conceal a transgression vs. secrets kept to protect one's feelings). Thus, they may hide something for self-serving (keeping the secret of a transgression they committed to avoid getting in trouble) or other-oriented purposes (concealing information to protect others). For example, Wilson and Pipe (1994) examined 5- to 6-year-olds' decision on disclosing a magician's transgression who accidentally spilled ink on some white gloves. After being urged to keep this a secret, results showed that most children did not disclose the accident. The same pattern of results was obtained in studies involving children's parents as accidental transgressors. Gordon et al. (2014) investigated 4-to-12-years old children's secret-keeping for a parent, demonstrating that this behavior increased with age and that promising to keep the secret was associated with fewer disclosures.

Nevertheless, the pattern was reversed when raising the stakes of keeping one's secret. Talwar et al. (2004) manipulated the stakes, showing that when children were faced with the possibility of being perceived as responsible for their parent's transgression, they were more likely to tell the truth about what happened despite promising to keep the secret. Other studies suggested that if the child was made an accomplice to the confederate's wrongdoing (e.g., the toys broke in their hands), they tended to keep the transgression a secret (Ahern et al., 2016; Quas et al., 2018; Stolzenberg et al., 2017). Recent evidence showed that likeability levels could also influence children's decisions about keeping or revealing one's secret about a transgression (Foster et al., 2023).

1.3.2.2. Deception[1]

Deception has been defined as "the deliberate attempt, whether successful or not, to fabricate and/or manipulate in any other way factual and/or emotional information by verbal and/or nonverbal means in order to create or maintain in others a belief that the communicator himself or herself considers false" (Masip et al., 2004; Vrij, 2008). Despite this overarching definition, we argue that trying to mislead others is not always a matter of simply fabricating a false belief. Instead, it may be more of an effort to fabricate the belief that the deceiver considers the information false and to instill this belief in the receiver's mind (Masip et al., 2004). This means we are not limited to using false information when misleading others as long as the target believes we are deceptive. Sometimes, this is an inherent characteristic of social contexts, such as negations or highly competitive games, where everything can be perceived as an attempt to deceive the recipient, including the truth (Sutter, 2009).

Speech Act Theory was considered one of the most influential theoretical frameworks in addressing the structural features of lie-telling (Austin, 1962; Lee, 2013). This theory posits that every verbal statement has a social function. Consequently, individuals may use simple or elaborate deceptive utterances to accomplish specific goals (Lee, 2000, 2013). From this point of view, verbal deception is governed by two universal components: *intentionality and conventionality*. As the broader definition of deception states, to successfully deceive others, one must *intend* to instill a false belief in the other's mind through well-thought-out fabrications.

The *intentionality component* has been largely debated regarding children's earliest form of lie-telling. For example, some findings suggest that children can tell lies from $2^1/_2$ years old

[1] This sub-chapter contains parts of the manuscript: Children's Lies: Intersecting Cognitive Development, Theory of Mind, and Socialization, published by Visu-Petra, L., Prodan, N., & Talwar, V., in the year (2022) in *The Wiley-Blackwell Handbook of Childhood Social Development, Third Edition*, doi: 10.1002/9781119679028.ch36

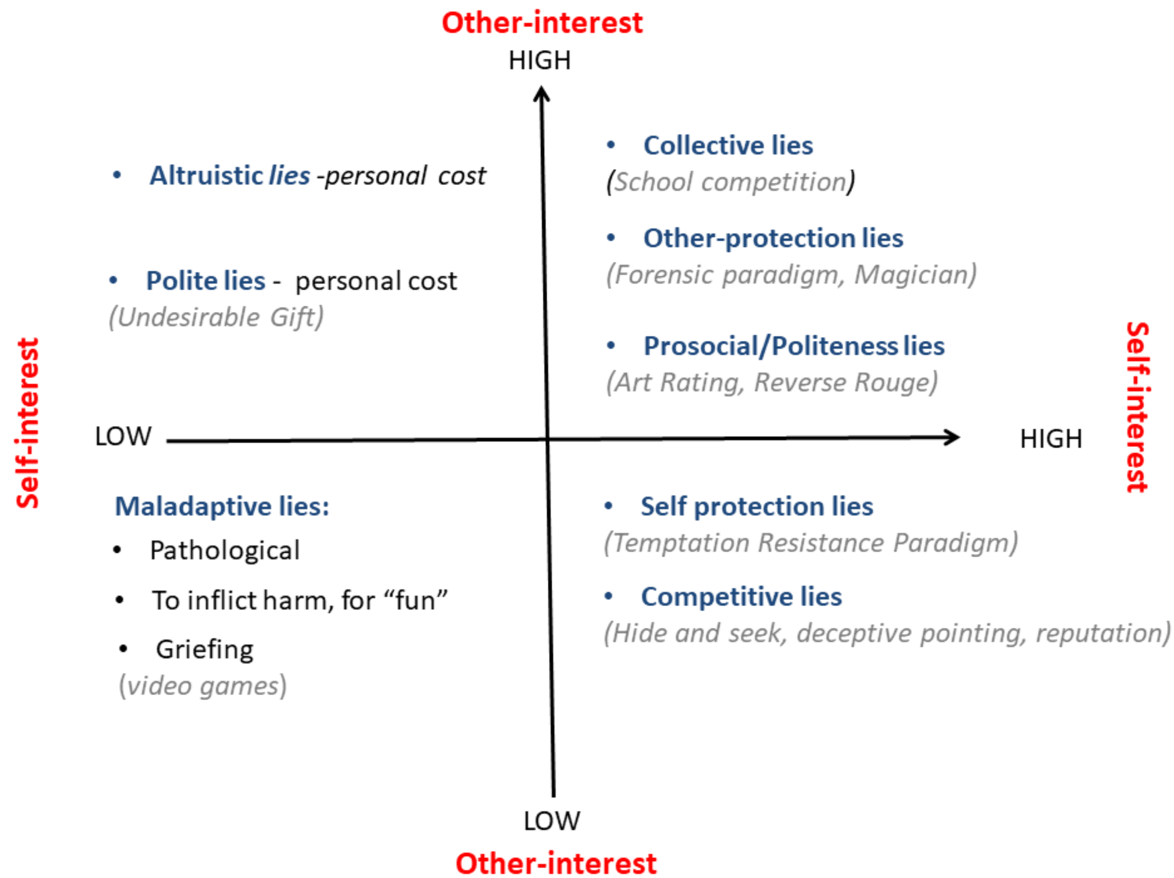
(Białecka-Pikul et al., 2020, 2022; Evans & Lee, 2013). However, other scholars and theoretical accounts of children's deception (e.g., the *Activation-Decision-Construction-Action Theory* adapted for children; Walckzyk & Fargerson, 2019) argue that between 2 and 3 years of age, children are in the *pre-deception stage*, their apparent lies (usually simple denials - *No, I did not do that!*), being rather non-intentional, as the mere result of heuristics activation. The role played by intentionality is best revealed by children's more sophisticated lies when they are required to elaborate on an initial lie. For instance, the temptation resistance paradigm (TRP; Lewis et al., 1989) allows for evaluating children's ability to maintain an initial lie through subsequent details to ensure plausibility. After children were left to decide if they would peek at a forbidden toy in the experimenter's absence, they were asked about peeking, giving them a chance to deny doing so (i.e., to lie). Their ability to feign ignorance and maintain the lie was then evaluated through follow-up questions, such as "What do you think it is?". Results suggested that most 2-year-olds revealed their transgression and deceptiveness by correctly naming the toy (Talwar & Lee, 2002, 2008), whereas older children were more successful in maintaining their lies by incorrectly naming it (which is referred to as *semantic leakage control*; Evans & Lee, 2011; Talwar et al., 2007).

Throughout socialization, children receive explicit messages about the negative consequences of deception, being encouraged to be honest and tell the truth even if that entails personal costs (Lavoie et al., 2016). At the same time, there are other contexts where being completely honest with others can be negatively perceived (Brimbal & Crossman, 2022). Therefore, children are also faced with implicit messages on when to deceive others (the *conventionality component*). In order to navigate the social environment adaptively, children need to understand the extent to which deception is socially accepted in specific situations (Lee, 2013). Notably, whereas lying to conceal transgressions for personal gain is condemned by most societies, lie-telling employed to spare others' feelings is considered more acceptable and even encouraged for politeness purposes (e.g., *Tell your aunt you like her gift, or she will be upset*). This delicate balance between being honest and deceptive depending on the social context and the benefits involved represents the *conventional paradox of deception*, which is best understood by children with increasing age (Heyman et al., 2009; Knapp et al., 2015).

To better understand the individual and social forces shaping them, we placed children's lies at the intersection between the child's Self-interest and their focus (or absence thereof) on Other-interest (interlocutor/social group; See Figure 1). When first practicing to deceive, children are mainly relying on their egocentric perspective, employing rudimentary forms of deception in order to avoid punishment or deflect responsibility (e.g., self-protection lies; Białecka-Pikul et al., 2022; Evans & Lee, 2013; Williams et al., 2017). Later, they chase specific material or social advantages and use deception to acquire them (e.g., desirable objects, social status, or reputation; Evans & Lee, 2011). However, only after broadening their social environment and acquiring the necessary socio-cognitive skills do they engage in other-benefitting deception, trying to protect others or be polite (the high other-interest axis in Figure 1; Levine & Lupoli, 2022; Talwar & Crossman, 2011). The current thesis focuses on children's self-serving deception (self-interest high, other-interest low) and how this unfolds throughout middle childhood.

Figure 1.

Types of Lies and the Main Experimental Paradigms Designed to Study Them (retrieved from Visu-Petra, Prodan, & Talwar 2022)



TOPAN MIHAELA
2023.10.16 13:33

1.3.2.2.1. Self-Serving Deceptive Behavior[2]

The first form of deception seen in children is self-interested and protective, often referred to as *antisocial lies*. To achieve the understanding of protecting themselves using deception, children must first realize that they are individual beings, separated from others, and that the consequences of their actions will reflect on their well-being (Talwar & Crossman, 2011). This ability develops around 15-24 months when the child begins to recognize himself in the mirror (Lewis et al., 1989). After this developmental milestone, past literature documents that children's lies aim to avoid imminent punishment, often employed as simple denials (Białecka-Pikul et al., 2022; Newton et al., 2000). Despite their appearances, they are usually considered spontaneous, without a clear intention of misleading others, but automatically deny their involvement in a specific transgression (Walckzyk & Fargerson, 2019). More so, most 3-year-olds are generally less inclined to lie than older children (e.g., 4-year-olds; Talwar & Lee, 2002; Talwar et al., 2002).

Besides avoiding an imminent punishment, children's self-serving lies can also be motivated by personal gains (rewards), which emerge in preschool years. Assisted by rudimentary forms of ToM, children are starting to realize the possibility of manipulating others' beliefs using deception in order to gain access to a desirable object. For example, Peskin (1992) showed that 87% of 5-year-olds lied about the location of a prize in order to keep it for themselves, while only 29% of 3-year-olds did the same. Children's motivation to lie becomes even more varied with increasing age being subjected to social influences. Lies told to keep secrets may also be considered self-serving lies if they are meant to hide a misdeed. When the stakes of keeping a secret were low, children were more likely to lie to the experimenter in order to keep the secret. In

[2] This sub-chapter contains parts of the manuscript: Children's Lies: Intersecting Cognitive Development, Theory of Mind, and Socialization, published by Visu-Petra, L., Prodan, N., & Talwar, V., in the year (2022) in *The Wiley-Blackwell Handbook of Childhood Social Development, Third Edition*, doi: 10.1002/9781119679028.ch30

contrast, if the stakes increased (e.g., they could be blamed for the transgression), they chose to disclose what happened irrespective of the partner's familiarity (a stranger vs. a parent; Talwar et al., 2004). This sets the stage for more complex lies told for social, not material, gains, such as reputation. After children learn about social values, they must decide how to behave to ensure a good reputation (after age 8; Heyman et al., 2021). We know that children negatively evaluate lies that could jeopardize someone's reputation (Shaw & Olson, 2015), but less is known about their actual lie-telling behavior for this type of social achievement.

In contrast with secrecy, previous literature showed that antisocial lie-telling decreases with age, with recent evidence supporting an inverted U-shape trend of children's self-serving lie-telling frequency across development (Buta et al., 2020; Carl & Bussey, 2019; 2022; Debey et al., 2015). This developmental trajectory is likely underpinned by their higher self-regulatory abilities and the increased internalization of moral standards after age 8 (Bussey, 1992; Carl & Bussey, 2022; Talwar et al., 2019). However, this is not the case for all kinds of lies. Longitudinal evidence showed that children's propensity to lie might change according to the motivational settings (Talwar et al., 2019). Whereas self-benefiting lies may decrease (e.g., lying to obtain a desirable object), research pinpoints that lies told to hide information about friends or other misdeeds are more frequently used with age and peek during adolescence (Dykstra et al., 2020a, b), a period characterized by increasing seek for autonomy and risky behaviors (Collado et al., 2014).

Experimentally, self-serving deception has been elicited in the modified Temptation Resistance Paradigm (TRP; Lewis et al., 1989; Talwar & Lee, 2002), which involved children as young as 2 years of age (Leduc et al., 2017). The setup motivates the child to earn a tempting prize based on a guessing game, providing them with the naturalistic opportunity to commit a transgression (e.g., peeking under a cover in the experimenter's absence in order to correctly “guess” the name of an animal which could not be inferred just from the sound played to the child). When the adult returns, the children are questioned if they have peeked. Lewis et al. (1989) found that 38% of 3-year-olds who peeked at the forbidden toy denied having done so, 38% confessed, and 24% gave no verbal response (see Leduc et al., 2017; Ma et al., 2015 for similar findings). The majority of 4–7-year-olds from a variety of cultures were found to swiftly deny their transgression (Butean et al., 2020; Talwar & Lee, 2002). To test their ability to maintain their initial denials, children were further probed with a *semantic leakage control question*, asking about the identity of the toy and then explaining how they reached that knowledge. While younger children often blurted out the name of the hidden toy, giving themselves away, older children’s ability to maintain their deceptive statements during questioning and feign ignorance of the toy’s identity increased. They were able to maintain deceptive plausibility using strategies such as “fortune attribution” (*I just got lucky*) or “capability attribution” (*I watch a lot of Animal Planet so I can recognize the sounds of animals*; Hu et al., 2020).

The TRP transgression involves rule violations and can raise moral or punishment concerns (Talwar & Lee, 2011). A more benign category of self-interested lying in children has been elicited via guessing games in which the experimenter does the guessing (i.e., *the hide-and-seek paradigm*; Ding et al., 2015). Children are usually asked to hide a treat under one of two similar-looking cups, and the experimenter can win the treat by correctly guessing its location, which means the child will lose the treat. Most of the time, the experimenter always follows the child's pointing in selecting the cup. This creates a zero-sum competitive context in which the only valid strategy for the child to win is to deceptively point to the wrong cup. Children as young as 2 years of age were shown to successfully misinform the recipient via deceptive pointing (*non-verbal deception*) in this task (Fu et al., 2018; Hala & Russell, 2001). Besides deceptive pointing, the hide-and-seek paradigm also allows assessing children's deception indications through *verbal misleading clues* meant to strategically deceive others. For example, Peskin & Ardino (2003) found out that 4- and 5-year-olds knew how to play a hide-and-seek game and successfully provided the confederate with explicit verbal instructions on how to hide. In other studies, preschool children (5-6 years old) successfully mislead the experimenter by verbally indicating the false location of an object (Sai, Ding, et al., 2018).

This paradigm allows for assessing the strategic deception of children, as well as its frequency across trials, which facilitates individual-level analyses of deceptive behavior. In this respect, a microgenetic design exposed children who were not deceptive at first to repeated encounters with the competitive hide-and-seek game (Ding et al., 2018). Over 10 days, most children spontaneously discovered how to deceive and maintained that strategy. Those with a better theory of mind (ToM) and executive functions (EF) were faster learners. In another study, training ToM for ten days with a program involving reasoning about other's mental states in different situations, compared to training to reason about properties of physical objects, was shown to further accelerate the discovery of the deceptive strategy, with the effects lingering for a month (Ding et al., 2015). This evidence was replicated in a recent study by Seucan et al. (2022) demonstrating the existence of two groups: one of children who never deceived across all sessions and a group who constantly deceived (around 85 % of the time), their performance being bidirectionally associated with their ToM scores. The reverse was also true, engaging in deception in the hide-and- seek game for 4 days with explicit instruction on how to deceive being shown to promote socio-cognitive skills like ToM and EF (Ding et al., 2018). Recently, Ding et al. (2022) found that training children in strategic deception involving a hide-and-seek game had a beneficial effect on their epistemic vigilance (i.e., one's ability to monitor the communicator's competence and honesty and recognize the underlying meaning of their statements; Sperber et al., 2010).

1.3.2.2.2. First- vs. Second-Order Deceptive Behavior[3]

When deciding to deceive, individuals often consider both the goals motivating their actions (self-directed vs. other-directed goals) and the social context that would make their statements more or less credible. Verbal deception commonly entails using false information that we are making others perceive to be true (i.e., *first-order deception*; Debey et al., 2015; DePaulo et al., 2003). However, there are also contexts in which the recipient can anticipate others' intent to deceive. This is especially true for highly competitive contexts, where people know others may try to trick them (e.g., poker games). In such circumstances, one can provide truthful information to others who are skeptical about being misled (i.e., *second-order deception*; Ding et al., 2014; Sai, Wu et al., 2018; Sutter, 2009).

While *first-order deception* was the subject of many research studies attempting to shed light on its socio-cognitive mechanisms and the most suitable ways to detect it (Debey et al., 2015; Sternglanz et al., 2019), far less is known about *second-order deception*. To further complicate matters, telling the truth to deceive was investigated under many names, making it more difficult for researchers to obtain an integrative view. Introducing the idea of telling the truth to deceive as a distinctive deceptive strategy, Sutter (2009) first named it sophisticated deception. It was documented that people engage in this kind of deceptive plot both in individual decision-making settings and team decisions while playing a cheap-talk sender-receiver game. The author proposed

[3] This sub-chapter contains parts of the manuscript: The Art of Telling the Truth to Deceive: A Matter of Intent, published by Prodan, N. & Visu-Petra, L., in the year (2022) in the journal: *Studia Psychologia-Paedagogia, 1*, LXVII, doi: 10.24193/subbpsyped.2022.1.05

that "telling the truth should be counted as an act of deception when the sender expects the receiver not to follow the sender's message and when the true message is sent for precisely this reason" (Sutter, 2009, pp. 56). Building on this preliminary evidence, other researchers referred to this deceptive strategy as manipulative truths (Kireev et al., 2017; Zheltyakova et al., 2021), second-order lying behavior (Ding et al., 2014; Sai, Ding et al., 2018; Sai, Wu et al., 2018), or paltering (Powell et al., 2020; Rogers et al., 2017; Schauer & Zeckhauser, 2007). First, according to Volz et al. (2015), second-order deception differs from first-order deception along two dimensions: the truth value of the statements (true vs. false) and the deceiver's belief about the recipient's expectations (to be deceived vs. not to be deceived). However, in both cases, the deceiver intends to mislead the recipient. Second, second-order deception differs from actual truth-telling based on the deceiver's intention (to deceive vs. not to deceive) and the deceiver's belief about the recipient's expectations (to be deceived vs. not to be deceived). Taken together, second-order deception can be considered a hybrid behavior, given that it conveys the truth while intended to be perceived as a lie (Volz et al., 2015).

Developmental literature on deception established that children as young as 3½ years can tell lies in various social situations (Evans & Lee, 2013; Leduc et al., 2017). However, most of the previous studies have examined children's *first-order deception*, in which participants make a false statement to intentionally mislead an unsuspecting target (Lee & Imuta, 2021; Sai et al., 2021). To our knowledge, only two empirical studies investigate the emergence of second-order deception in children. In the first one, Sai, Ding, et al. (2018) explored 4- to 6-year-old children's ability to use truthful and untruthful claims to mislead a confederate in relation to their socio-cognitive development (e.g., second-order ToM and cognitive flexibility). Using a modified "hide-and-seek" task, researchers found that children as young as 4 can tell second-order lies (correctly indicating the location of a coin to mislead the opponent). They also showed that this deceptive behavior was only related to second-order ignorance, a prerequisite of second-order ToM, and not to cognitive flexibility or second-order false-belief understanding. We argue that this might be because children's second-order ToM is just starting to develop in that age range, as well as their cognitive flexibility. The other study addressing second-order deception in children involved school-age participants between 12-14 years of age (Leng et al., 2019). The authors were interested in the brain mechanisms of second-order deception, engaging children in instructed truth/lie trials vs. chosen truth/lie trials. During these trials, they measured participants' response times (RT) and event-related potentials (ERPs). Results were in line with previous research on adult samples, showing that deception intentions, rather than simply making counterfactual statements, increased the demand for cognitive control in liars.

The investigation of second-order deception across development has important methodological and practical implications. Further research would enrich our understanding of how intentions and social contexts may modulate interpersonal deception's neurocognitive processes. Moreover, this line of research extends the investigation of deception by highlighting that instead of classifying statements as true or false, it may be more insightful to consider the intention driving the use of true or false statements when examining the cognitive and neural markers of deception (Carrion et al., 2010; Sai, Wu et al., 2018). From a practical standpoint, the investigation of second-order deception can also inform practitioners' work in applied settings. For instance, in legal interviewing settings, it is essential to acknowledge that people can also use truthful information to deceive if they perceive that the recipient is skeptical about the veracity of their statements. This can inform interviewers of their best practices regarding rapport building and how their attitude towards the interviewee can impact the quality of the information obtained.

On the other hand, if we consider children's demonstrated ability to use second-order deception for personal gain (Leng et al., 2019), the ecological investigation of this deception can shed light on promising ways to facilitate education. For example, moral education can also focus on teaching children how to identify the intentions of others and not just focus on their behaviors (Sai, Ding et al., 2018).

1.3.3. A New Perspective on Second-Order Deceptive Behavior[4]

In real-life situations, telling the truth may involve elaborate descriptions of a situation, providing specific details that would inform our recipient about different aspects. There are few occasions in which the decision between telling the truth and lie-telling involves a simple choice between naming a straightforward thing (e.g., indicating the right or the left hand), such as the one presented in most experimental paradigms investigating second-order deception. Moreover, others often question our statements, which requires us to make additional arguments to convince the recipient.

Reviewing the literature to date on first- and second-order deception, we observe a significant difference in how truth-telling and lie-telling were tested. For example, past developmental research distinguished different deception sophistication levels employed using counterfactual statements (first-order deception), ranging from simple denials of things to elaborate false statements meant to ensure consistency (Evans & Lee, 2011). In contrast with this refined perspective on first-order deception, all the studies investigating second-order deception are based on a more rudimentary usage of the truth/lie. In the tasks described so far measuring

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second-order lies, the truth entailed a concise claim that was carried out sometimes by simply pressing a button, pointing in a direction, or telling a simple truth. For example, Sutter (2009) instructed participants to choose between two response options to maximize their monetary gains. More specifically, participants had to send a message to an opponent regarding the monetary consequences of two different options: Message A: "Option A will earn you more money than Option B." or Message B: "Option B will earn you more money than Option A.". Participants had to send one of the messages to the other to maximize their gains depending on their expectation that the other will follow their recommendation. As such, to use second-order deception, people had to make a simple choice between two predetermined messages without giving further arguments to convince others, as would happen in real life.

Considering the methodological and theoretical disparities in the literature, we propose that second-order deception, similar to first-order deception, can also have different levels of sophistication. In contexts where the deceiver has to mislead a target across multiple consecutive occasions (e.g., poker games), second-order deception could be employed by flexibly adjusting to the opponent's actions. This would lead to lower executive and mentalizing demands, and thus, we named it *elementary second-order deception*. In other settings, individuals may have to ensure the plausibility of their lies through subsequent explanations (similar to the TRP tasks for first-order deception). Here, second-order lying would entail alternating between more elaborate pieces of truthful and false information (e.g., "*I know this because I saw a documentary about this*"). Despite telling the truth, based on the deceiver's intention, telling the truth is canny, requiring higher cognitive sophistication in order to devise such a deceptive plot (Sai et al., 2021). Considering this, we named it *advanced second-order deception*. Thus far, previous literature has focused on the elementary second-order deception in child and adult samples (Ding et al., 2014; Leng et al., 2019; Sai, Ding et al., 2018).

Addressing the structural features of second-order deception, we also pinpoint the aspects that could make it more challenging to employ. Research showed that lie-telling and truth-telling can become habituated depending on their frequency of use. The *habituation effect* refers to how frequent/repeated a communication strategy should be (e.g., lie-telling) to become habituated and impose cognitive costs when adopting another strategy (e.g., truth-telling; Visu-Petra et al., 2014). Most cognitive perspectives on dishonesty argue that lie-telling is costly because truth-telling represents the default response type (Spence, 2004). Nevertheless, other research on the habituation effect suggests that if lying is used frequently enough, it can become a prepotent response, imposing cognitive costs on individuals' subsequent attempts to tell the truth (Verschuere et al., 2011). Even though there is no investigation on the habituation effect in children's dishonesty, let alone of their second-order lie-telling habituation, we argue that this effect could be involved in constructing these lies. More specifically, if children are getting used to telling truths/lies to deceive by inferring that the interlocutor is aware of their intention to deceive, when this strategy needs to be changed based on the target's actions (switching to telling lies/truths), this would be more challenging for children to employ. However, we need empirical data to validate this theoretical assumption.

1.4 Individual Factors Associated with Children's Dishonest Behavior

1.4.1. Baseline Cognitive Processes

With age, children's socio-cognitive development advances. Several baseline cognitive processes, such as *processing speed* and *short-term memory*, are considered at the core of these advancements (Fry & Hale, 2000). Scholars suggest that the speed of individuals' *information processing* is a task-independent construct meant to capture the speed at which individuals can perform basic cognitive functions, proved to influence a great range of cognitive processes across development, such as intelligence, memory, or attention (Hale & Jansen, 1994; Tourva & Spanoudis, 2020). A growing body of evidence suggests that developmental changes in processing speed led to an increase in the executive functioning of school-age children (8-13 years; Kail, 2007; Nettelbeck & Burns, 2010; Tourva & Spanoudis, 2020), which in turn has been significantly associated with children's dishonest abilities (Alloway et al., 2015; O'Connor et al., 2020).

Addressing the role of processing speed in dishonest behavior, Bond (2012) posited that processing speed is a crucial mechanism, and thus, it should be examined separately from other higher-end cognitive factors. Nevertheless, only a few studies addressed this recommendation and included processing speed as a separate measure besides the classic executive functioning measurements (e.g., inhibitory control or working memory). In adult samples, for example, Varga et al. (2015) found that processing speed was a significant predictor of participants' ability to conceal relevant information in a mock-crime scenario, with those with higher processing speed scores being less likely to be detected as knowledgeable in subsequent tests (e.g., in the Reaction Time Concealed Information Test; RT-CIT). The same pattern of results was replicated in primary school-age children using an adapted version of the RT-CIT paradigm (Visu-Petra et al., 2016). Visu-Petra et al. (2016) found that for children possessing relevant information in a surprise scenario, processing speed (measured as simple reaction time) was positively associated with their accuracy during RT-CIT, making them less likely to be classified as knowledgeable. This means they were more successful than their counterparts in concealing a secret. However, to this date, there have been no empirical attempts to replicate these findings in children. In line with the previous limited literature, processing speed should allow children to reason about the social contexts in which dishonesty could be a benefiting strategy more swiftly and to implement it successfully based on its association with higher-order cognitive processes such as executive functioning.

Another primary cognitive process that contributes to individuals' overall development is *short-term memory (STM)*. This term refers to our capacity to remember recent information across limited periods (e.g., seconds or minutes; Aben et al., 2012), as the maintenance of this information does not entail processing it. Generally, children's phonological memory span (i.e., the maximum number of items that can be remembered in a pre-established sequence) starts from an average of two to three items and gets to about six in middle childhood (Gathercole, 1998; Hulme et al., 1984). Similar to processing speed, short-term memory has been considered more of a general construct, laying the foundation for higher-order cognitive processes, such as working memory (the ability to maintain and manipulate information encountered recently; Aben et al., 2012).

Given its influence on higher-order forms of cognitive processing (e.g., executive functioning), the STM association with dishonesty seems rather implicit. However, to date, we have found limited to no investigations on the association between STM and deception in adults or children. Visu-Petra et al. (2016) included in their study a separate measure of STM (a digit span task) but obtained non-significant results on the association between children's accuracy or response latency in concealing a secret and their STM performance. This could be explained by its interactions with other executive functioning measures, which could have hindered its direct effect on children's deceptive abilities. Nevertheless, we posit that STM may be at the core of children's dishonesty, given its crucial functions in developing other essential processes for children's ability to conceal something or mislead others. For example, while carefully monitoring the social context in order to make sure that their secret is not revealed, children must show the ability to maintain active, even for a short time, the content of communication and the admonition not to disclose, for which STM facilitates the manipulation of those data based on the ability to retain them over a specific time, which will further dictate their subsequent actions (e.g., alteration behaviors if the secret could be revealed). Furthermore, when deciding to use deception, SMT facilitates children's ability to juggle multiple pieces of information by keeping them active. Consequently, children's STM span is paramount, dictating the complexity of their deceptive endeavors and response latencies.

1.4.2. Theory of Mind[5]

A growing body of evidence suggests that in order to be successful, dishonest behavior relies on different levels of awareness about the other's mind (Ruffman et al., 1993). Children's understanding of the mind (i.e., theory of mind; ToM) allows them to perceive another person's desires, intentions, and beliefs as different from their own and realize that these mental states can influence behavior (Wellman, 2001). The involvement of ToM skills in generating and sustaining dishonest behavior implies a sequential development (Osterhaus et al., 2016; Wellman & Liu,

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2004). The developmental stages of ToM range from ***knowledge access/ignorance attribution*** (i.e., understanding that the other does not have access to the same perceptual information: *The adult does not know that I peeked because they were not here*) to first-order false belief understanding (***1st-order ToM***; *The adult thinks that I did not peek*), and then to more recursive thinking enabled by second-order false belief understanding (***2nd-order ToM***; *The adult could think that I know the answer because I learned it in school*). Finally, in its most advanced forms, ToM involves understanding the constructivist aspect of the human mind (***interpretive diversity understanding***; *A stranger can believe I know the answer from school, but my teacher would not because she knows we did not learn that information in class*). This coordinated development led researchers to conclude that "*deception is theory of mind in action*" (Lee, 2013).

Children's ability to understand and practice ***secrecy*** is strongly related to ToM. Preschool children can understand secrets and how sharing or keeping secrets can affect their social relationships (Corson & Colwell, 2013), which requires adequate perception of others' feelings, desires, and beliefs. Colwell et al. (2016) found that children with higher levels of ToM development also had more detailed narratives about secrets than their counterparts with lower ToM scores. Moreover, preschoolers' ToM was also positively associated with their ability to keep a secret about a surprise (Perkins & Ardino, 2003).

When children decide to use *self-serving deception* to achieve specific goals, ToM was proved to assist them in telling more complex lies as they age. The most acknowledged theoretical model addressing the development of children's lying behavior is *the three-stage model* proposed by Talwar and Lee (2008). According to this model, children's lie-telling ability progresses through three stages, from the *primary lies stage* (2- to 3 years of age) to the *secondary lies stage* (3- to 5 years of age), and finally reaching the *tertiary lies stage* (6- to 8 years of age). We adopted this model of deception in order to emphasize ToM's involvement in children's deceptive behavior across development.

The ***primary lies stage*** begins during preschool and is characterized by self-serving lies for children's protection or personal gain (e.g., *I did not peek at the toy*). In many instances, such lies are considered unintentional, as they require no cognitive sophistication (Ahern et al., 2011) and usually consist of simple denials of incriminating truths. As a result, the deceptive nature of these spontaneous dissents was often questioned, being considered more of a *pre-deception phase*, in which children are not even aware of their denials' impact on others' minds (Walczyk & Fargerson, 2019). However, Jakubowska and Bialecka-Pikul (2020) argued that children can express first-order intentionality when lying from the first year of age. They are actively trying to align the recipient's behavior in order to obtain a favorable outcome for themselves (i.e., *deceptions-in-action*). For example, when a toddler falsely accuses tummy pain to benefit from their parents' attention, it can be considered that they are expressing an intentional act to bring about a convenient result. Despite the apparent lack of sophistication in children's primary lies, several studies show that children as young as 2 years old are successfully lying to obtain personal gains and that their performance is significantly related to rudimentary mental state understanding (Ma et al., 2015). In particular, several findings suggest that children's *knowledge access/ignorance attribution* is a positive predictor of their ability to deceive, allowing them to correctly infer the perceptual access of the interlocutor in a given context (Leduc et al., 2017; Ma et al., 2015; Moldovan et al., 2020).

Only around age 4 children are starting to understand that beliefs can be incorrect and that false beliefs can be created in others (i.e., *first-order ToM*). Based on that realization, they manipulate others' beliefs through lying, usually in low-stake and self-serving contexts, trying to avoid negative consequences or obtain personal gain. This cognitive advancement is the hallmark of ***secondary lies***, expressing children's intention to actively modify one's mental states. As such, the increase in preschoolers' lie-telling propensity rests on their ability to represent others' beliefs explicitly and to realize how their actions or utterances influence the recipients' mental state (Jakubowska & Bialeka-Pikul, 2020).

Previous research shows that successful young lie-tellers better understand false beliefs than those who confess their transgressions (Bigelow & Dugas, 2009). Existing evidence suggests that compared with 2- and 3-year-olds who usually peek and then confess their misdeed in a TRP task, most 4- and 5-year-old children deny peeking at the forbidden toy when asked (Evans et al., 2011; Polak & Harris, 1999; Talwar & Lee, 2002, 2008). Furthermore, a training study supported ToM as a unique independent predictor and a causal factor in lie-telling behavior. Increasing 3-year-olds' awareness about mental states and false beliefs allows them to lie for material gain (Ding et al., 2018). Also, Ding and collab. (2015) taught 3-year-old children how to deceive in only 10 days. In order to gain material benefits (e.g., treats), children had to provide deceptive information to an experimenter in a hide-and-seek zero-sum game. Their results suggested that ToM ability and executive functions differentiated between children who rapidly discovered self-benefiting deception and those who did not. Moreover, Talwar, Crossman, et al. (2017) found that children who did not lie at all had the lowest ToM scores, and children who used both types of lies (e.g., self-benefiting lies and other-benefiting lies) had the highest ToM scores, demonstrating that early false-belief understanding supports using deception as a social strategy across various contexts.

With regard to *second-order lying* (i.e., the ability to make use of truthful information to deceive in competitive contexts), the literature showed that second-order ignorance (i.e., children understand that opponents do not know the truthfulness of their statements), a precursor of 2nd -order ToM, was an independent predictor of children's propensity to successfully use the truth to deceive in preschoolers. ToM's involvement in elementary second-order deception was seconded by neuroimaging studies on adults, suggesting that second-order deception is associated with a higher demand for socio-cognitive processes than first-order deception, requiring greater anticipation of others' mental states. This was highlighted by the increased functional interactions of the right TPJ with the right precuneus, the primary ToM nodes (Volz et al., 2015; Zheltyakova et al., 2020). However, to demonstrate its association with higher-order ToM developments, more complex forms of second-order deception must be assessed.

Despite their increasing ability to flexibly manipulate the informational content transmitted to others depending on how much it helps them achieve their goals, a growing body of evidence also shows that most children between 3-to-5 years of age have difficulties maintaining consistency between initial and subsequent statements. In this respect, Talwar and Lee (2002) improved the classic guessing game task by adding follow-up questions that would allow seeing if children who denied looking or touching the toy could maintain the lie through successive questioning, an ability also known as *semantic leakage control*. They introduced questions such as "What toy do you think makes this sound?" and "How did you know what it was?". The results showed that children under 3 years of age blurted out the identity of the forbidden toy even though the sound was difficult to discriminate and unrelated to it. Instead, other research studies demonstrated that children only begin to control their semantic leakage around 6- to 8 years of age (Evans & Lee, 2011; Talwar & Lee, 2008), meaning they can sustain their lies afterward.

This close track of previous contents transmitted to the recipient is one of the most acknowledged hallmarks of children's ***tertiary lies*** that develop after age 6. Based on a fair amount of empirical evidence, children's ability to maintain an initial lie is influenced by the development of second-order ToM that enables them to understand others' beliefs about the abstract world and reflect upon how their statements can influence others' well-being (Evans & Lee, 2011; Lee & Imuta, 2021; Talwar & Crossman, 2011; Sai et al., 2021). To this end, children can recognize their chances to lie successfully and construct plausible justifications in case of subsequent questioning. Consequently, the most notable gain of this stage is that children are now constructing their lies based on *the plausibility principle*. That is, they are building their subsequent explanations resting on a piece of truthful information that can aid them in remembering the details afterward (hence reducing the cognitive load imposed by lying; Walczyk & Fargerson, 2019). Several studies demonstrate that children's deceptive behaviors are better constructed at this age, thus successfully controlling their semantic leakage. For instance, in a study employed by Talwar, Gordon, and Lee (2007), 6- to 11-year-old children participated in a modified TRP task in which they were instructed not to peek at an answer to a trivia game question in the absence of the experimenter. Using a series of follow-up questions, the confederates assessed children's ability to sustain their initial false denial, showing that children's ability to maintain consistency between their initial lie and subsequent verbal statements increased with age and was significantly related to their performance on second-order false-belief tasks. Children with higher second-order belief scores were more likely to hide the source of their knowledge regarding the correct answers and invent a plausible explanation for knowing them.

More recent theoretical contributions argue that children's mastery of deceptive behavior does not peak in middle childhood. According to Walczyk and Fargerson (2019), after the age of 12, children are increasingly capable of successfully anticipating the social contexts in which lying might be at hand by calculating the risks involved (i.e., *anticipatory deception*). Moreover, we argue that children's ability to tell even more complex lies is positively associated with advanced ToM developments, such as *understanding interpretive diversity* (Moldovan et al., 2020). This ability enables children to understand the constructivist nature of the human mind and that people can interpret ambiguous information differently depending on their previous experiences (Weimer et al., 2017). However, to date, there is no empirical evidence of the association between interpretive diversity understanding and children's self-serving deception.

1.4.3. Executive Functions[6]

Executive functions (EFs) refer to a family of top-down mental processes that allow us to concentrate, pay attention, control, and coordinate other cognitive abilities and behaviors (Diamond, 2013). They encompass various cognitive processes, such as ***inhibitory control*** (the ability to suppress prepotent responses – thoughts or actions), ***working memory*** (allowing us to hold and process targeted information), or ***cognitive flexibility*** (the ability to switch between multiple tasks), which were frequently highlighted as potential mechanisms underlying children's dishonest behaviors (Sai et al., 2021; Williams et al., 2020).

Slepian's (2022) recent model of *secrecy* posits that the ***active concealment*** of a secret involves monitoring, expressive inhibition, and alteration behaviors, which echo executive functioning. When deciding to conceal the secret, children must carefully monitor their social context and interactions, which requires cognitive control and sustained attention to environmental stimuli. If the possibility of revealing the information is detected, they must inhibit it while remembering the admonition not to disclose and trying to distract the interlocutor's attention from

[6] This sub-chapter contains parts of the manuscripts: The Art of Telling the Truth to Deceive: A Matter of Intent, published by Prodan, N. & Visu-Petra, L., in the year (2022) in the journal: *Studia Psychologia-Paedagogia, 1,* LXVII, doi: 10.24193/subbpsyped.2022.1.05

the sensitive subject. This would entail high levels of inhibitory control and working memory in order to juggle and manipulate multiple pieces of information at once without lowering the interaction quality. Lastly, cognitive flexibility must be in place for alteration behaviors (e.g., changing the subject, answering a different but related question that does not imply revealing the secret, etc.), aiding them to swiftly switch between conflicting pieces of information. Despite these theoretical considerations, developmental literature failed to find strong relationships between children's secrecy and some EFs (Ahern et al., 2016; Quas et al., 2018; Lavoie & Talwar, 2020). Williams et al. (2020) showed that working memory negatively predicted children's decision to disclose a minor transgression, whereas inhibitory control was not significantly related. Authors posited that secrecy may tap into different aspects of EFs. If children are not required to fabricate statements in order to ensure secrecy, concealment might not tap into children's inhibitory abilities that much.

When they decide to use ***deceptive behaviors*** for specific purposes (e.g., secrecy, avoiding punishments, or gaining an advantage), their *inhibitory control, working memory, and cognitive flexibility* were shown to be significant predictors of children's lie-telling propensity and proficiency (Alloway et al., 2015; Sai et al., 2021; Talwar, Lavoie et al., 2017). Previous literature found a significant improvement in children's inhibitory abilities and working memory from preschool ages onward, the most significant gains being documented between 7–12 years (Brocki & Bohlin, 2004; Nelson et al., 2022), which could be indicative of the parallel progression of children's ability to tell increasingly complex lies and their EFs' development. More specifically, to tell a lie, children must be able to *inhibit* the truth while actively searching for plausible deceptive scenarios to ensure plausibility. They must also *remember* the admonition not to disclose something that might subsequently get them in trouble while constructing falsehoods to cover their misdeeds. Furthermore, as they age, children usually use a piece of truthful information in order to construct a plausible lie, which in turn requires a constant *switch* between pieces of true and false information to be successful (Babkirk et al., 2015).

A recent meta-analysis reviewing 47 studies (5099 participants) involving children between 2-19 years yielded a significant but relatively small global effect size for the association between children's deceptive behavior and EFs (r = .13; Sai et al., 2021). However, their analysis further demonstrated that EFs' correlation with children's self-protective and self-benefiting lies was significantly greater than their associations with other types of lies children tell across development (e.g., prosocial lies). Also, the effect size was significantly higher for the association between EFs and children's maintenance of lies compared to the association with their initial lies, which aligns with the parallel developmental trend mentioned above (O'Connor et al., 2020; Williams et al., 2017).

Attempting to unfold the involvement of EFs in ***second-order deception***, past research mainly focused on the neural correlates involved in the adults' socio-cognitive processes supporting deception. Employing different types of methodologies (e.g., ERP, fMRI, or fNIRS), researchers found that if the communicator intends to deceive the recipient, telling the truth entails a similar cognitive load as false statements (Carrion et al., 2010; Kireev et al., 2017; Sip et al., 2010; Volz et al., 2015; Zheltyakova et al., 2020, 2021). For example, Carrion et al. (2010) demonstrated that misleading intent is the key to the cognitive demand imposed by deception, irrespective of how it is carried out (using truthful or false statements). Furthermore, they found that both truthful and false claims made with a deceptive intent elicited more extensive event-related potentials (ERPs). In line with these findings, Sip et al. (2010) showed that in a zero-sum dice game, participants' decision to deceive was associated with higher activation of the frontopolar cortex, which is involved in managing competitive goals, decision-making, working memory, and conflict management (Mansouri et al., 2017), key aspects of deception.

With respect to children's EFs and second-order deception, the limited existing evidence is somewhat mixed. For example, Sai, Ding et al. (2018) reported non-significant associations between preschoolers' elementary second-order deception (as we defined it) and their cognitive flexibility. Instead, Leng et al. (2019) found that school-age children's deception intention underlined the increased demand for cognitive control in those who chose to deceive, but they did not specifically address EFs but the general brain mechanisms using electroencephalographic data. This puzzling evidence could be explained by the different cognitive demands imposed by the EF and second-order deception tasks. For instance, Sai, Ding et al. (2018) used a hide-and-seek task to assess children's ability to alternate between truths and lies to deceive, in which children had to switch between strategies from one round to the other. Due to the repetitive nature of the task, this might have imposed lower executive demands than the cognitive flexibility tasks used. More so, in line with what Sai et al. (2021) reported, the lack of findings with EFs could rely on children's lie-telling sophistication. When playing that hide-and-seek game, children were not asked to maintain their second-order lies; hence, their initial lies had a weaker, non-significant association with EFs. More research is needed to unfold the relationships between children's second-order deception and EFs beyond preschool years when the tasks measuring second-order deception could be more complex, demanding more executive control.

1.4.4. Internalizing Symptoms

Racine et al. (2021) showed in a meta-analysis that the prevalence of child and adolescent depression and anxiety was around 25.2% and 20.5% across studies, emphasizing that it doubled during COVID-19 compared to the pre-pandemic period. Given these increasing rates, we should also focus on the potential impact of internalizing symptoms (anxiety, depression) on children's social behaviors. The relationship between children's internalizing problems and dishonesty received relatively less attention in the past literature.

Secret-keeping, for instance, was previously related to lower well-being outcomes in adult samples, such as depressed moods or low self-esteem (Frijns & Finkenauer, 2009), especially when the secret content was traumatic. A possible mechanism explaining the association with internalizing problems is *mind-wandering* (defined as "decoupling between the locus of one's attention and the processing of information related to a current goal"; Slepian et al., 2017), which prone individuals to spontaneously think about a secret outside the concealment context, and hence, increasing the mental and emotional costs if it entails sensitive information (Slepian, 2022). In children and adolescents, a higher frequency of keeping secrets from their parents was bidirectionally associated with greater depressive symptoms over time (Dykstra et al., 2020b; Frijns & Finkenauer, 2009). If internalizing problems seem to foster secret-keeping frequency, other evidence suggests that anxiety or depression could hinder individuals' ability to successfully keep them. For example, heightened anxiety was previously linked to poorer accuracy in individuals' responses, making it easier to classify them as possessing secret information (Visu-Petra et al., 2012). However, other studies do not strongly sustain these relationships (e.g., Kozel et al., 2005). With regard to children's secret-keeping and emotional problems, Visu-Petra et al. (2016) found that children with higher OCD symptoms (although subclinical) were less accurate in their attempt to conceal the fact that they possess relevant information in a surprise scenario. Nevertheless, this piece of evidence needs replication in order to draw sound conclusions.

The same pattern of results was also obtained with regard to children's ***lie-telling for self-protecting or benefiting purposes***. In adolescents, depressive symptoms and lie-telling frequency were positively and bidirectionally associated over time. Here, a specific category of lies emerged: lies about mental health, which had the most robust positive relationship with depressive symptoms, with crucial implications for clinical settings (Dykstra et al., 2020a). These relationships remained significant even after controlling for other important factors, such as parent-child relationship quality, showing that adolescents who frequently used deception with their parents were more likely to have emotional problems (depression, stress, or low self-esteem; Engels et al., 2006). Nevertheless, less is known about how internalizing symptoms shape children's actual deceptive behaviors rather than their frequency and how this emerges earlier than adolescence when their socio-cognitive development is increasing.

1.5. Contextual Factors Involved in Children's Dishonest Behavior

1.5.1. Parental Practices

Children receive explicit and implicit instruction about the importance of honesty from early on. Parents, considered the most influential social agents in children's socialization, can exercise this influence directly (through various instructions about honesty) or indirectly (through parental practices; Talwar & Crossman, 2022). Parental practices designate a set of specific and goal-directed behaviors used by parents in order to employ their caregiving actions (Georgiou, 1996). Within these practices, *emotional warmth*-related rearing behaviors are characterized by increased care and attention toward children, with high support levels and consideration for their needs (Alegre et al., 2014). Conversely, *parental rejection* includes negative behaviors, such as criticisms, harsh discipline, or disapproval of children's actions, which are negatively associated with their socio-cognitive adjustment across development (Brumariu & Kerns, 2010). *Overprotective or controlling* parental-rearing behaviors are also significantly linked to children's poor adaptation or externalizing behavior (Muris et al., 2003). These practices designate parents' attempts to strictly govern children's actions and limit their age-adaptive autonomy across various settings (Grolnick, 2002).

All these parental actions are inherently involved in children's socialization about honesty and their subsequent dishonesty. The domains-of-socialization approach proposed that children's socialization takes place in several domains: (a) guided learning; (b) group participation; (c) control; (d) protection; (e) reciprocity (Grusec & Davidov, 2010). Building on this theoretical framework, Tong and Talwar (2021) argued that most of the evidence on parenting and children's (dis)honesty falls into the control domain, in which parents seek to obtain children's compliance in various settings. We will further review the evidence on parenting behaviors that could shape children's reliance on dishonesty.

As children age, they tend to keep more and more secrets from their parents, attempting to impose their autonomy. Frequent secret-keeping longitudinally predicted lower parent-child relationship quality over time (Dykstra et al., 2020b). Children's willingness to disclose sensitive information and communicate openly with their caregivers is also highly influenced by their parents' rearing behaviors. More specifically, Smetana et al. (2006) found that parental support positively predicted children's levels of disclosure about school and other personal issues. Similarly, longitudinal evidence showed that adolescents with warm and supporting parents (e.g., demonstrating an effort to understand their children's problems) put more value on honesty and, therefore, disclosed more over time (Tilton-Weaver et al., 2010; Wissink et al., 2006). Similar findings were reported in school-age children, with mothers' authoritative parenting significantly predicting children's willingness to share important information with them, which in turn was positively associated with their use of positive coping strategies (Almas et al., 2011). When using lie-telling to conceal various things, research showed that parental controlling behaviors fostered adolescents' deceptive behavior frequency to gain autonomy (Baudat et al., 2022; Bureau & Mageau, 2014; Smetana et al., 2009). In reverse, Baudat et al. (2020) found a negative relationship between children's usage of deception and autonomy-supportive parental practices. A recent systematic review supported these findings, arguing that a high frequency of lie-telling is positively associated with parental lack of communication and approval (Eguaras et al., 2021).

Parental-rearing practices also have a substantial impact on children's lie-telling sophistication. Given their essential influence on the overall socio-cognitive development of children, parental practices were shown to moderate the relationship between children's lie-telling skills and socio-cognitive processes, such as ToM or EF. Recently, Ding et al. (2023) demonstrated that parental warmth moderated the relationship between preschoolers' ability to maintain their lies in a temptation resistance paradigm and ToM performance. They found a negative association between children's semantic leakage control and ToM for children with high parental warmth but a positive relation between these variables in children with low parental warmth. This aligns with other findings on parenting styles and children's semantic leakage control, demonstrating that supporting parental rearing practices, such as increased warmth, may foster children's forthcoming and honesty when interacting with others (Ding et al., 2023).

In line with the moderating effect of parental behaviors, Talwar, Lavoie et al. (2017) showed that authoritative parenting moderated the relationship between inhibitory control and children's self-benefiting lie. Their findings suggest that children with authoritative parents and higher inhibitory abilities were less likely to tell antisocial lies to cover a misdeed and win a prize. However, they also pointed out that when some of these children decided to lie, their subsequent ability to maintain the initial lies was superior to others. Thus, positive parental rearing practices may facilitate children's social development by reducing their reliance on deception to achieve personal goals while promoting their successful lie-telling when needed. All this evidence suggests that children's pathway to (dis)honesty is indeed a tangled web, as Walter Scott admitted in their poem. Consequently, it warrants further investigation beyond preschool years, when the parent-child relationships know new dynamics (Malloy et al., 2019).

1.5.2. Peer Relationships

As children enter middle childhood, they become increasingly aware of the need to establish and maintain new relationships (Bosacki, 2021). The shift between child-parent and peer-to-peer relationships becomes more transparent as children age, and their sensitivity to sociocultural influences increases. Thus far, the literature on children's dishonesty has given limited attention to peer relationships despite the growing body of evidence showing that children's dishonesty peeks during adolescence and tends to be more socially oriented (Debey et al., 2015; Talwar et al., 2019).

Social domain theory posits three main domains of knowledge relevant to deception: moral, social-conventional, and psychological (Smetana, 1997). Of particular interest for middle childhood dishonesty is the psychological domain, which encompasses personal and prudential aspects. The personal aspects involve individual issues like self-identity, whereas the prudential aspects include health or safety issues. As children's reliance on peer relationships increases, they try to assert their autonomy and control some of the issues usually governed by parents (e.g., rules for safety, such as curfews; Rote & Smetana, 2015). Children attempt to obtain and maintain control over personal and prudential issues through strategies such as secret-keeping or deception (Baudat et al., 2022; Gordon et al., 2014; Liu et al., 2023).

With increasing age, children realize the importance of sharing and keeping secrets in personal, meaningful relationships, especially with peers. For example, 8-to-11-year-olds define secrets as inherent to friendships, stressing the importance of keeping a secret for a friend (Lavoie et al., 2016). As for the actual behavior of secrecy, Visu-Petra et al. (2016) demonstrated children's willingness to keep a secret from a peer in a surprise scenario, their performance in concealing the relevant information being significantly predicted by executive functioning.

The same pattern of results was found in children's willingness to lie for a peer. Evidence on children's prosocial lie-telling suggests that with age, they were more likely to tell a prosocial lie for the benefit of an in-group peer than for an out-group one (Sierksma et al., 2019), emphasizing the importance of peer relationships in middle childhood and adolescence. More so, other findings suggest that children's judgments about their previous dishonest behavior (e.g., cheating and lying) were influenced by their perceptions of their peers' honesty (Evans & Lee, 2014). Participants with high rates of cheating and lying were more biased toward thinking that their peers would have done the same, whereas those with lower rates of dishonesty perceived their peers as being more honest.

Nevertheless, less documentation exists on children's self-serving lies used toward their peers. In this respect, Perkins & Turiel (2007) investigated adolescents' reasoning about lying to friends and its acceptability, showing that most of them negatively evaluated lying to their friends because that violated the relational trust. Conversely, participants who evaluated lies in the personal and prudential domain as acceptable justified their acceptance of lie-telling to friends in invoking their right to privacy or willingness to avoid conflict. Going beyond children's evaluations of lying to friends, Dykstra et al. (2020) explored in a longitudinal study the self-reported lie-telling frequency to friends in relation to friendship quality and depressive symptoms. They found that lower levels of friendship quality positively predicted lie-telling frequency over time and that more frequent lie-telling was associated with greater depressive symptoms. These findings are indicative of children's reliance on friendships as essential support systems, as the majority of lies reported were related to mental health. Strengthening this line of inquiry, recent findings suggest that greater impulsivity in children positively predicted children's lie-telling over time in various contexts, including friendships (Dykstra et al., 2023). Instead, Lavoie & Talwar (2022) found that better ToM performances predicted early adolescents' endorsement to disclose information to friends and parents about situations where they could choose to protect themselves, and a preference for being more forthcoming toward peers than parents.

In spite of these valuable findings on children's evaluation or self-reported rates of lie-telling to friends that could be subjected to bias (Evans & Lee, 2013; Talwar & Lee, 2002), to the best of our knowledge there are no empirical investigations on children's actual deceptive behavior to their friends in more competitive contexts in which a desirable gain could be at stake. Addressing this issue could shed some light on the complexity of children's balancing between their reliance on friends for acceptance or social support and the concurrent needs for independence or self-affirmation (Fink, 2021).

1.5.3. Socioeconomic Status

One of the most prominent contextual factors that indirectly shape various aspects of children's lives is socioeconomic status (SES). Past research established that lower socioeconomic status can have a detrimental effect on children's socio-cognitive and emotional development (Letourneau et al., 2013; Peverill et al., 2021). For example, longitudinal findings suggest that early on, children's EF development varies as a function of SES (measured as income-to-needs ratio and highest parental education) and that this relationship is mediated by other environmental factors, such as cognitive stimulation at home (Dilworth-Bart, 2012; Rosen et al., 2020).

Nevertheless, research investigating the association between SES and dishonest behavior suggests a less straightforward relation (Talwar & Crossman, 2011). On the one hand, several studies showed that lower SES predicts an increase in children's propensity to peek and lie about doing so (e.g., Achenbach & Edelbrock, 1981; Thijssen et al., 2017; Allen & Lewis, 2020). On the other hand, other research found a positive relation between children's cheating behavior and SES proxies (Alan et al., 2020). A possible explanation for these contradictory results could be related to the effect of certain indirect factors, such as family characteristics, on children's development. Namely, factors such as parental stress, harsh parental practices, or disruptive familial contexts usually associated with lower SES might indirectly impact children's lying behavior and secrecy (Talwar & Lee, 2011; Tobol & Yaniv, 2019). For example, Thijssen et al. (2017) investigated whether social, psychological, and neurobiological factors are related to deceptive behavior in children. They asked 163 8-year-olds to predict random events in low- versus high-risk conditions. Results suggested that children who were repeatedly deceptive in the high-risk condition were more likely to come from lower-income families, and their mothers generally had a lower educational level. As an explanation, the authors posited that lower-educated parents might not always be able to provide an adequate family climate for the moral development of their offspring (McLoyd, 1998; Thijssen et al., 2017).

However, the reverse could also be possible. Indirect evidence suggests that highly educated mothers tend to offer more support and acceptance to their children (Hoff et al., 2002). Consequently, children coming from higher SES families could feel more confident in their freedom to cheat and/or lie for personal gain, knowing they are supported and understood by their parents even though they may act out sometimes. At this point, it is somewhat hard to rely on one of the two perspectives, as other socialization factors must be considered in order to make sense of the differences between parental practices and SES in children's lie-telling, such as the educational environment.

1.5.4. Bilingual Education[7]

Besides social agents and economic welfare, children's dishonesty could be impacted by other environmental factors, such as the educational environment. Previous research suggests that a secure educational environment can foster children's learning and development (Nguyen et al., 2020). As for children's dishonest behavior, similar to harmful parental rearing practices, being in a punitive school environment was associated with more false denials and less semantic leakage than in a nonpunitive one (Talwar & Lee, 2011). A punitive environment can foster dishonesty by offering both more opportunities to deceive and more incentives to do so to avoid harsh punishments.

[7] This sub-chapter contains parts of the manuscript: Children's Lies: Intersecting Cognitive Development, Theory of Mind, and Socialization, published by Visu-Petra, L., Prodan, N., & Talwar, V., in the year (2022) in *The Wiley-Blackwell Handbook of Childhood Social Development, Third Edition*, doi: 10.1002/9781119679028.ch36

In the current political context, with new policies and a greater influx of migrants worldwide, learning a second language has become desirable for children. *Bilingual education* may represent one way of learning a new language during childhood (Backer, 2007), leading to *sequential bilingualism* (Baker, 2001, p. 93). “Strong” bilingual education applies to the educational contexts in which a second language is used for teaching, often referred to as “immersive bilingual education” (where children speak the maternal language at home and a second language at school; Baker, 2007). In a recent review of the effects of bilingual education on child development, Bialystok (2018) concluded that “bilingual education is a net benefit for all children in the early school years”. Immersive bilingual education can also be used as a proxy for bilingualism, broadly defined as individuals’ ability to use two languages in everyday encounters (Grosjean, 2010; Özşen et al., 2020).

In spite of its necessity nowadays, there are few investigations of the relationship between bilingualism and children’s dishonesty. The evidence of this relationship comes mostly from adult samples, showing that lying in a second language could be associated with a greater emotional distance, facilitating lie-telling (Duñabeitia & Costa, 2015; Kreyßig & Krautz, 2019). Another factor worth mentioning is the cognitive load that lying in a foreign language could impose on individuals’ ability to be convincing, leading to comparable response latencies between lie-telling and truth-telling – if lying could be easier in a second language because of emotional distancing, truth-telling could become more challenging, these two effects being antagonistic (Caldwell-Harris & Ayçiçeği-Dinn, 2008; Suchotzki & Gamer, 2018).

As for children’s dishonesty, we found only one study addressing the difference between monolingual and bilingual children and their lie-telling behavior. In a Bachelor’s thesis, Elisabeth (2018) examined young children’s lie-telling in a temptation resistance paradigm, showing that monolinguals were likelier to lie than their bilingual counterparts and had higher ToM scores. This evidence is, however, at odds with indirect findings suggesting a "bilingual cognitive advantage", with bilingual children having superior performance on ToM tasks than monolinguals (Goetz, 2003). More so, a meta-analysis of 16 studies found a small-to-medium effect size for this association (Schroeder, 2018). As potential mechanisms accounting for a ToM advantage in bilingual children, Yu et al. (2021) argue that bilingualism offers children the context to exercise relevant processes for ToM's development, such as *sociolinguistic awareness* (the ability to grasp that people are not always speaking the same language and that they may have to change the language they use depending on the others' needs) or *metalinguistic awareness* (the realization that words are simple labels of objects and that they could have multiple meaning to different people). Therefore, ToM could mediate the relation between children's lie-telling behavior and bilingualism. However, more evidence is needed to detangle bilingualism's influence on children's deception and the indirect paths that may emerge.

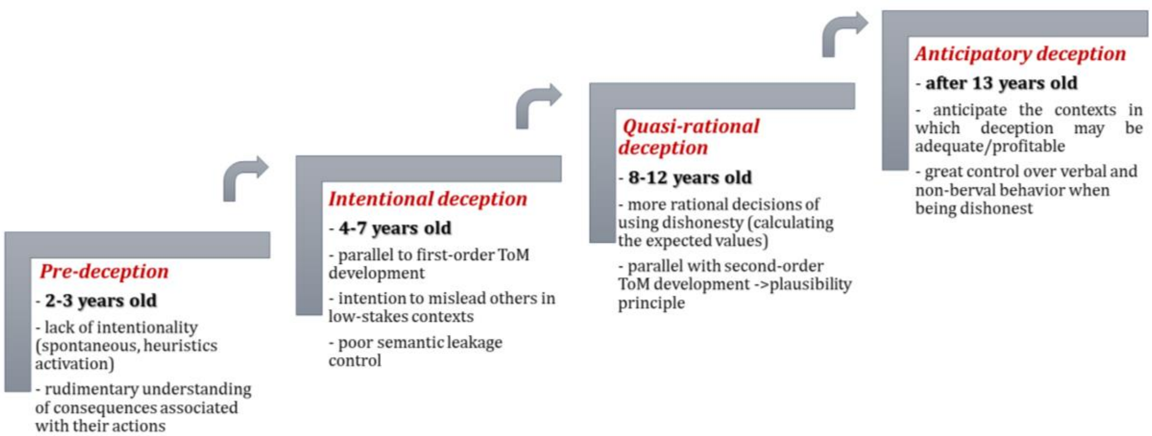
1.6. Theoretical Accounts of Children's Dishonest Behavior

1.6.1. The Activation-Decision-Construction-Action Theory (Walczyk & Fargerson, 2019)

Talwar & Lee (2008) were the first to propose a comprehensive theoretical framework for the association between children's dishonest behavior and socio-cognitive development, namely, the *three-stage model*, which was further extended by Walczyk and Fargerson (2019) through the Activation-Decision-Construction-Action Theory (ADCAT) of deception adapted for children (see Figure 2). The first three stages of ADCAT mirror the three-stage model, pinpointing specific details about children's lack of intentionality in the emergence stage (*pre-deception stage*) and the rationality that guides children's deceptive endeavors beginning school-age years (the plausibility principle applied in the *quasi-rational deception stage*). The last stage aims at extending the knowledge on children's developing dishonest abilities by addressing how their skills advance in pre-adolescence. Children come to anticipate the contexts in which they could act dishonestly, having an adequate understanding of the conventional paradox of deception (Lee, 2013). Moreover, they are skilled at controlling their overt (verbal and non-verbal) behaviors to sustain their lies in high-stakes contexts as they practice the delivery of lies across various settings (Walczyk & Fargerson, 2019).

Figure 2.

Developmental Stages of Children's Deceptive Abilities in the ADCAT Model



The ADCAT posits that being deceptive entails four major components, which ToM and EFs sustain differently. The first component is *Activation*, which involves retrieving relevant information with working and short-term memory assistance. In this initial phase, ToM could facilitate children's understanding of what the interlocutor expects and knows. Critically, the ADCAT extension provided by Moldovan et al. (2020) argues that rudimentary forms of ToM, such as *ignorance attributions* or *knowledge access*, would enable children to understand that

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others are not knowledgeable of some facts and thus, help them reason if being dishonest can be an adequate strategy. Previous findings on preschoolers suggest that children with high levels of knowledge access acquisition were more likely to transgress and deny doing it (Leduc et al., 2016; Ma et al., 2015). This would imply that, in the resistance to temptation paradigm, children can infer that the experimenter does not know if they lied because they were not present in the room. Hence, they do not have access to that information. With age, higher-order ToM and EF developments (e.g., planning) would also enable children to anticipate truth solicitations and the context in which lie-telling could be successful (Wellman, 2001). We argue that the same process is involved in secret-keeping, as Slepian's (2022) model of secrecy admits that concealing information requires *activating* that knowledge in a relevant context.

Once they can reason about the chances of getting caught and anticipate others' actions, children face the *Decision* to be dishonest or not. In order to make that decision, children are helped by their EFs and ToM in calculating the expected values of honesty and deception. From this point of view, younger children's decisions to deny some wrongdoings seem rather non-intentional, based on heuristics and spontaneity (Białecka-Pikul et al., 2022; Walczyk & Fargerson, 2019). Nevertheless, children engage in *quasi-rational deception* from the school-age years, meaning they calculate the difference between the benefits of deception vs. truth-telling. Here, advanced forms of ToM (e.g., second-order ToM or interpretive diversity understanding) may assist children in mentally projecting how different people would interpret the same information to decide between truthful and false details (Moldovan et al., 2022). These complex decisions are, however, cognitively demanding, imposing a great cognitive load.

In secrecy, children also face, according to Slepian (2022), a decision – to reveal or conceal a secret, which could impose the same cognitive load. Children's attempts to keep a secret by withholding relevant information in an RT-CIT paradigm showed lower accuracy and greater response latencies when nonverbally denying the recognition of relevant stimuli (Visu-Petra et al., 2016). This could be explained by the costs imposed on EFs, such as inhibitory control and working memory. Nevertheless, besides the socio-cognitive factors, the motivational context could also impact children's decision-making, with previous literature suggesting that with increasing motivation (e.g., high stakes), respondents will assign greater cognitive resources in preparing a lie and deciding on how to convey it (Colwell et al., 2007).

With the decision to manipulate others' beliefs through lying, children are elaborating a deceptive response in the *Construction phase*. Children can choose between verbal and non-verbal means of deception at this stage, with younger children being more inclined to use behavioral means to deceive. For example, previous research found high rates of successful deception in preschoolers as young as 2 years using deceptive pointing in a hide-and-seek paradigm (Ruffman et al., 1993; Sodian et al., 2003). Nevertheless, their choices might illustrate the practical side of deception, where children aim to modify their behavior rather than manipulate their mental states due to the lack of ToM skills that would enable that (Moldovan et al., 2020).

With increasing age, ToM and EF assist children in constructing *plausible lies.* To be successful in more complex deceptive endeavors, children must inhibit the prepotent truthful responses while juggling multiple pieces of information and switching between truths and false to ensure consistency (Talwar & Crossman, 2011). The TRP paradigms offer, in this respect, the best context for assessing children's ability to tell plausible lies. Children's primary lies (between 3-5 years) are characterized by lower levels of semantic leakage control, as they do not hold a higher-order ToM understanding to maintain them successfully (Evans & Lee, 2011). After age 7, children are increasingly proficient in their attempts to maintain their lies, concurrent with developing second-order ToM (Talwar & Lee, 2008). This advanced ToM could also allow children to tell even more complex types of lies, such as second-order lies, in which they understand that their utterances are perceived as lies by the interlocutor due to the highly competitive context (Ding et al., 2014; Sai, Ding et al., 2018).

The construction phase in the active concealment of secrets would entail the monitoring and expressive inhibition processes posited by Slepian's (2022) model. These cognitively demanding processes supported by EF help individuals assess how well they are keeping secrets and the level of danger in slipping secret-related information in their utterances.

Lastly, the *Action* component entails the delivery of the mentally practiced and prepared lies to the recipient. In this phase, ToM allows children to monitor the target's reactions to their falsehoods and adapt their behavior accordingly (DePaulo et al., 2003). For example, intersecting Slepian's (2022) model of secrecy with the ADCAT model, we argue that if the danger of revealing a secret is detected, the action component comprises various alteration behaviors (e.g., answering to other related questions or diverging the discussion to other matters, unrelated to the secret), which are similar to what someone, who is already lying, would consider doing in order to ensure the plausibility of their lies.

Even though dishonesty is recognized as socially embedded, to our knowledge, there are fewer attempts to integrate the individual and contextual factors of children's dishonesty into one comprehensive theoretical framework.

1.6.2. An Integrative Model of Children's Self-Serving Dishonesty – Individual and Contextual Influences

We define dishonesty as a broad concept encompassing different behaviors employed for self- or others-oriented interests. Dishonest behaviors for self-serving purposes include concealing, cheating, or deceiving (Muñoz Garcia et al., 2023; Srour, 2021). As stated before, all these specific behaviors can have different levels of complexity, ranging from concealing a secret by remaining silent to more sophisticated ways of hiding something (*alteration behaviors*), such as lie-telling (Slepian, 2022).

When deciding to use deception in specific contexts, children can adopt various strategies to be successful. They can use false information to mislead others (*first-order deception*), which in turn can be conveyed non-verbally through deceptive pointing or verbally, using specific indications (e.g., *The sticker is in the blue box*), denials (e.g., *No, I did not peek!*), or more elaborated false utterances to ensure consistency and plausibility (e.g., *I know this because I learned it in school*). Nevertheless, in highly competitive contexts, children could anticipate the interlocutors' knowledge about their intentions to deceive and how a suspicious target can perceive their (un)truthful statements. Hence, children may use truths and lies to deceive others in specific settings (e.g., zero-sum games), a misleading strategy known as *second-order deception*. Depending on how second-order deception is conveyed, we are further distinguishing between *elementary* vs. *advanced second-order deception*. The elementary second-order deception involves a flexible adjustment to the interlocutor strategy and short true/false, verbal or non-verbal responses (e.g., in hide-and-seek paradigms where children have to indicate or point to a specific location; Leng et al., 2019; Sai, Ding et al., 2018). In turn, its advanced form requires elaborated statements meant to maintain an initial lie using truthful and untruthful information that has not been empirically investigated.

In line with previous theoretical models, we posit that children's deceptive behaviors are sustained by specific socio-cognitive processes, such as ***baseline cognitive processes, ToM,*** and ***EFs***, depending on their sophistication (Talwar & Lee, 2008; Walczyk & Fargerson, 2019). Preschoolers' early denials to avoid punishments are supported by rudimentary forms of ToM development (ignorance attributions/knowledge access; Leduc et al., 2017; Ma et al., 2015), and they require low levels of executive functioning. As children age, their deceptive strategies become more varied (alteration behaviors for active concealment, cheating, or lie-telling), requiring greater socio-cognitive skills. For example, first-order ToM could assist children in realizing that they can alter someone's mental state and instill false beliefs through lying, increasing 4-year-olds' propensity to lie compared to younger children (Talwar & Lee, 2008). In order to maintain their initial lies or construct more elaborate ones, children need to acquire higher-order ToM forms, such as second-order ToM (Evans & Lee, 2013) or interpretive diversity understanding (Moldovan et al., 2020), which facilitate their recursive thinking and understanding of the active mind.

Similarly, EFs were shown to be differently associated with children's lies depending on their complexity, meaning that the stronger relationship between EF and deception was found for their ability to maintain their lies, which is indeed more cognitively demanding than for their initial, more simple lies (Sai et al., 2021). We posit that secrecy also involves ToM and EF, the active concealment process of secrets relying on monitoring (which requires understanding others' mental states), expressive inhibition, and alteration (Slepian, 2022). Nevertheless, their influence on secret-keeping may rely on more basic cognitive processes, such as processing speed or short-term memory (Visu-Petra et al., 2016). Furthermore, if concealing does not imply telling an elaborate lie, some EF may not be strongly associated with secrecy (e.g., inhibitory control; Williams et al., 2020).

Besides the socio-cognitive factors, we also emphasize the importance of emotional aspects of children's development in their propensity and proficiency to be dishonest. Adolescents' ***internalizing problems*** (e.g., depressive symptoms) have been longitudinally and bidirectionally associated with their secret-keeping and lie-telling frequency, with detrimental effects on their social relationships (child-parents and peer relationships; Dykstra et al., 2020a, b; Dykstra et al., 2023; Lavoie et al., 2017). These findings set the stage for the socio-environmental influences that could impact children's dishonesty as they age. Perhaps children's internalizing problems mediate the relationship between poor social relationships and their frequent use of deception.

If children's knowledge about *how* to succeed in their dishonest endeavors could be dictated by their socio-cognitive and emotional abilities, their developing sense of *when* it is acceptable/profitable to do so is mainly shaped by *socio-environmental forces,* such as parental practices, peer relationships, socioeconomic status, or educational environment. We already know that ***parental rearing practices*** are strongly related to children's overall development, including dishonesty. Parental support and autonomy were proven to foster children's disclosure and honesty, whereas controlling and harsh parental tendencies increased their reliance on secrecy and deception (Baudat et al., 2022; Bureau & Mangeau, 2014; see Eguaras et al., 2021 for a review). Furthermore, strengthening the influence of parenting, other findings suggest that parental practices moderate the relationship between children's propensity and proficiency to deceive and their socio-cognitive development (Ding et al., 2023; Talwar et al., 2017). These results were obtained for ToM and EF (inhibitory control), the principal mechanisms explaining deception in children (Lee & Imuta, 2021; Sai et al., 2021). More so, recent studies suggest a more nuanced relationship between ToM, for example, and children's propensity to mislead others for personal gain. More advanced ToM may shape the path to distinct deceptive profiles, such as occasional or instrumental liars (Lavoie et al., 2017), which could be modulated by contextual factors.

Similarly, ***peer relationships*** are also essential contexts in which children can practice dishonesty. Previous research demonstrated that poorer friendships predicted higher rates of lie-telling over time, which can impact adolescents' internalizing problems without a robust support system (Dykstra et al., 2020a, 2023). Despite these crucial findings, children's dishonesty in the context of peer relationships did not receive that much attention in the literature. Perkins and Turiel (2007) showed adolescents complex ways of reasoning about whether it is acceptable to lie to their peers, which warrants more investigation into their actual lie-telling behavior.

Lastly, the current model emphasizes the importance of other, more distal contextual factors that could indirectly affect children's deception. For example, ***socioeconomic status*** was associated with children's socio-cognitive development through its effect on other relevant aspects, such as parental practices. In this respect, previous findings suggest that lower SES predicts harmful parental practices (e.g., harsher discipline) because the financial stress imposed by limited resources leaves little room for parents to focus more on their children's emotional needs and moral development (Thijssen et al., 2017). Moreover, recent studies demonstrated that EFs vary as a function of SES, and that parental factors, such as cognitive stimulation, fully mediate this relationship (Rosen et al., 2020). Therefore, children's socio-cognitive development or other social factors (e.g., parental practices) could mediate the relationships between SES and children's dishonesty.

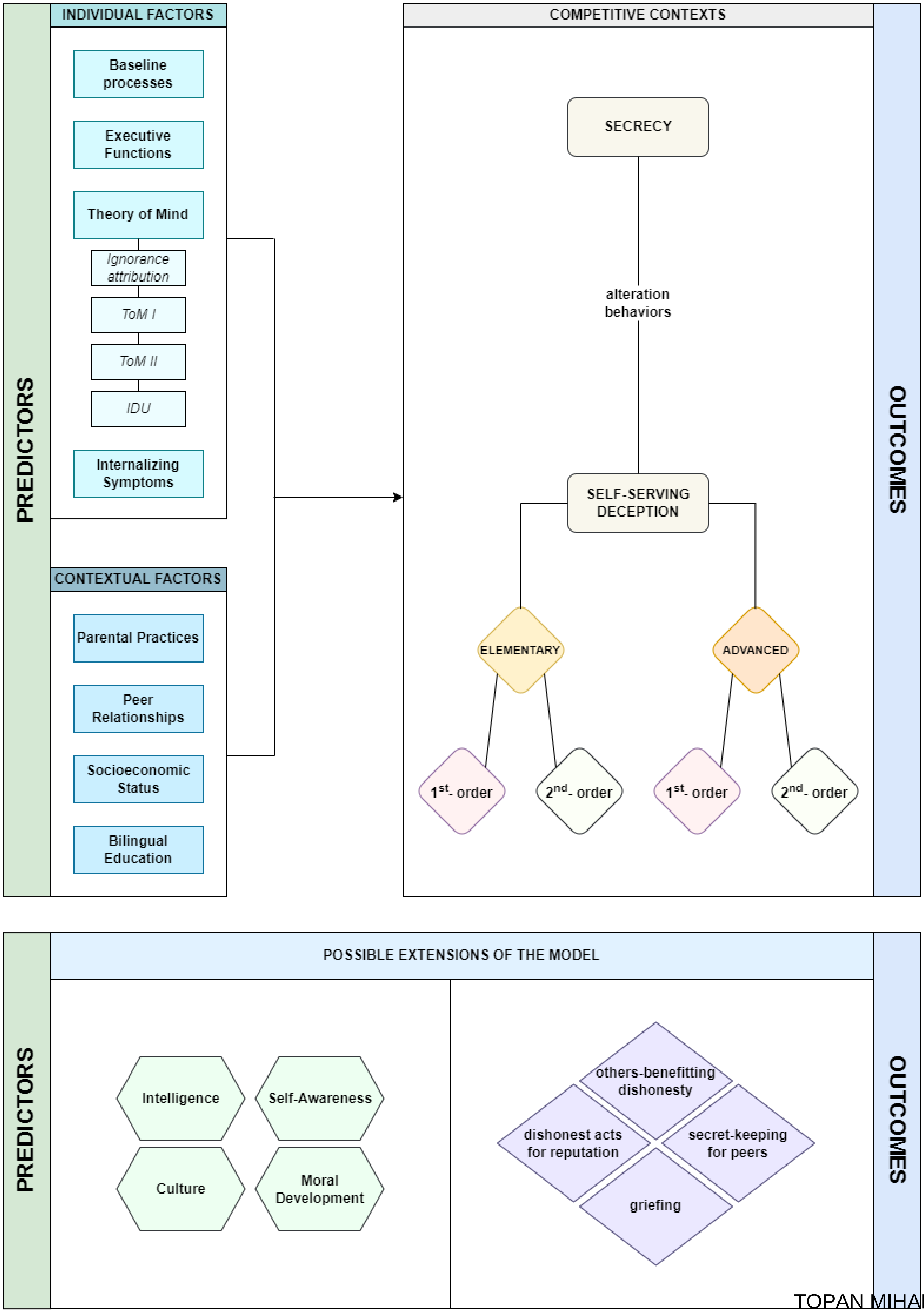
The other important factor to be accounted for is the educational environment, which was previously shown to influence children's reliance on deception if punitive (Talwar & Lee, 2011).

We refer to the sequential bilingualism acquired through the school environment (***bilingual education***), previously linked to an advantage in deceptive abilities for bilingual individuals (Suchotzki & Gamer, 2018). As a possible mechanism explaining this advantage, ToM was shown to have higher levels of development in bilingual children than in monolinguals due to relevant skills, such as metalinguistic or sociolinguistic awareness (Yu et al., 2021). Therefore, it is likely that ToM mediates the relationship between deception and bilingualism, but this was never investigated in children. More so, other evidence suggests that children's access to bilingual education also depends on their socioeconomic status, with higher SES families being more inclined to adhere to such forms of education for their children (Baker, 2007).

All this evidence emphasizes the importance of addressing the interrelations between the individual and contextual factors in detangling the intricacies of children's dishonesty (see Figure 3 for the integrative model overview and possible extensions).

Figure 3.

The Integrative Model of the Individual and Contextual Factors Involved in Children's Self-Serving Dishonesty in Middle Childhood and Its Possible Extensions



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CHAPTER II. RESEARCH AIMS AND METHODOLOGY

2.1. Theoretical Aims

Children's dishonesty is viewed as a double-edged sword. On its constructive side, it is a normative behavior and a developmental milestone in children's socio-cognitive and moral development (Talwar & Crossman, 2011). However, at the darker end of dishonesty, its frequent usage can be associated with dire developmental outcomes (e.g., depressive symptoms, poor social relationships, delinquent behavior; Dykstra et al., 2020a, b; 2023; Lavoie et al., 2016; Stouthamer-Loeber & Loeber, 1986). This developmental paradox is somewhat fostered by the social influences putting the acceptability of dishonesty on a continuum rather than a dichotomous scale. The current thesis focuses on the interplay between individual and contextual factors in predicting school-age children's different types of dishonest behaviors in competitive settings.

Aim 1

Our first aim was to investigate ***different types of dishonesty in school-age years***, ranging from simple concealment to strategic attempts to deceive using elaborate statements. More importantly, we focus on the less investigated types of deception in school-age children, namely ***second-order deception***. To better understand this strategy of conveying misleading messages to others, we advance a ***new theoretical framework*** regarding its levels of sophistication, distinguishing between ***elementary and advanced second-order deception*** based on the socio-cognitive mechanisms underlying them. We provide the first empirical evidence in the literature on school-age children's elementary second-order deception by testing it in different competitive contexts. In Study 2, we extend the previous limited findings on preschoolers and focus on the structural features of elementary second-order deception, assessing a potential ***habituation effect*** when telling truths and lies based on their frequency. We also address the ***motivational features*** of telling truths and lies to deceive in Study 3 by changing the context and focusing on ***peer relationships*** that can impact children's reliance on deception for personal gain depending on the familiarity of the target (familiar vs. unfamiliar peers).

Aim 2

The second aim of the current thesis is to investigate the ***developmental differences*** in children's dishonest behaviors in school-age years, which are marked by intensive cognitive advancements and social changes. We address this aim in Study 1 by employing a ***longitudinal*** investigation of children's ability to conceal relevant information in order to keep a secret for self- and other-oriented benefits in a memory-based testing paradigm, wanting to capture the ***developmental progression*** of this ability and the subtle changes that could appear due to the motivational aspects involved. We also tap into ***the developmental question in Study 2*** regarding children's elementary second-order lie-telling since little is known about how second-order deception evolves beyond its emergence point. In Study 3, we indirectly focus on the developmental particularities of children's deception by investigating ***primary school-age children's propensity to deceive familiar and unfamiliar peers*** for personal gain. This way, we capture children's lie-telling in a sensitive developmental window when the shift between parent-child and peer relationships emerges. Lastly, Study 4 also assesses ***age-related differences in children's sophisticated deception***.

Aim 3

The third objective of the current thesis is to explore the ***individual and contextual mechanisms*** supporting children's dishonesty throughout middle childhood. We explore the individual mechanisms of children's dishonesty in all of our studies by investigating their relationship with various types of dishonesty, such as concealment (in Study 1), first-order deception (in Study 3 and 4), and elementary second-order deception (in Study 2 and 3). In this respect, we investigate the following ***socio-cognitive and emotional factors***: baseline cognitive processes (processing speed and short-term memory; Study 1), theory of mind (assessed in all the studies, but in different developmental stages, such as ignorance attribution, first-order ToM, second-order ToM, and interpretive diversity understanding), EFs (inhibitory control, cognitive flexibility, and working memory; Study 1, 2, 3), internalizing problems (anxiety and depression; Study 1). We also explore the ***socio-environmental (contextual) mechanisms*** of children's deceptive behavior in Study 2 where we include *socioeconomic status* as a predictor of children's elementary second-order deception. Study 3 addresses another essential contextual factor, *peer relationships*, focusing on children's deception toward familiar and unfamiliar peers. Lastly, we test the interrelations of children's strategic dishonesty and contextual factors in Study 4 by assessing *parental practices* (warmth, rejection, and overprotection/control), socioeconomic status, and *bilingual education* as predictors for children's cheating, first-order lie-telling, and semantic leakage control.

Aim 4

Building on previous literature and present findings, our last aim is to advance a ***new integrative model of children's self-serving dishonesty*** that extends the previous models and unifies some of the individual and contextual factors associated with children's self-serving dishonesty (see Figure 1 above). Based on previous theoretical models (e.g., *the three-stage model*, Talwar & Lee, 2008; *ADCAT-child*, Walczyk & Fargerson, 2019), we provide a fine-grained perspective on different levels of sophistication in children's self-serving dishonest behaviors in middle childhood while focusing on some of the most relevant individual and contextual mechanisms underlying them. Along with assessing the socio-cognitive factors in all the studies encompassed, in Study 3 we tap into peer relationships as one of child development's most important social factors and their lie-telling propensity. Study 4 represents our attempt to provide evidence for other parts of this new model by focusing on the interrelations between advanced ToM and socio-environmental influences such as parental practices, socioeconomic status, and bilingualism.

2.2. Methodological and Practical Aims

One of the biggest challenges in the literature has always been ecological validity. The initial investigations of children's dishonest behaviors relied on observational studies (Newton et al., 2000), while others adhered to experimental paradigms paralleling those used in adult samples by instructing children to lie about particular things (Feldman & White, 1980). However, these conventional experimental paradigms lacked ecological validity, creating an artificial setting for dishonesty (Gullotta, 2013; Talwar et al., 2012). Despite developing new, more adequate paradigms to access various types of dishonesty in children (e.g., the temptation resistance paradigm, the hide-and-seek paradigm), the literature still struggles with creating motivational contexts mirroring real-life contexts, especially for older children.

Aim 1

Our first methodological aim was to devise a new paradigm for assessing the elementary levels of children's strategic deception. To this end, in ***Study 2,*** we ***adapted a hide-and-seek paradigm*** to assess school-age children's ***elementary second-order deception***. Based on the methodology employed by Sai, Ding, et al. (2018), we devised a more complex task containing more rounds and additional trials, increasing the complexity of alternations between deceptive strategies and making possible the assessment of its structural features (e.g., *habituation effects*). Moreover, we test children's understanding of the recipient's intent by introducing a manipulation check – a ***random round*** involving no systematic rules leading to success (the experimenter randomly chose one of the participants' hands irrespective of their indications). This modification may increase the ecological validity of the paradigm assessing elementary second-order deception by introducing the randomness of individual choices in everyday contexts (the fact that people sometimes change their minds when interacting with others and they do not follow strict rules like those imposed by the rest of the task; Forgas & East, 2008).

Aim 2

Following the same overarching aim of improving the experimental settings of accessing children's dishonesty, our second objective was to ***create an ecological paradigm*** capturing other ***motivational elements*** of dishonesty in middle childhood. In ***Study 3,*** we focus on children's lie-telling and truth-telling to deceive in the context of ***peer relationships*** by ***developing a new interactive and competitive hide-and-seek paradigm*** involving two ***familiar/unfamiliar peer opponents*** in a computerized game. We address children's competitive behavior in peer relationships by testing their sensitivity to the opponents' familiarity (familiar vs. unfamiliar peers) and their actions (following the child's indication about the object's location or acting in opposition to their indication) and focus on their ***propensity to mislead their peers*** as a function of these considerations (***opponents' familiarity and trustfulness***) for personal gain. Moreover, in each game round, children were faced with two opponents. We chose this third-party design by considering the social nature of deception and the real-life settings in which individuals may have to lie in the presence of other witnesses (e.g., a group of friends; Xiong et al., 2022). The new paradigm entailed ***increased stakes*** as we created salient rewards that were also part of the game as stimuli that could be earned. All these elements contribute to the ecological validity of the paradigm, which is implemented for the first time in the literature.

Aim 3

Our third methodological aim is to investigate older children's advanced deceptive skills by maintaining their initial lies through subsequent explanations in conjunction with their higher-order ToM (interpretive diversity understanding). Consequently, in ***Study 4***, we developed a more ***complex version of the temptation resistance paradigm (a Trivia game)*** to evaluate children's propensity to cheat and lie and their proficiency to maintain their lies. We adhere to the individual level of analyzing children's dishonest behavior, introducing two occasions for children to peek at the correct trivia game answers and then lie about that. This way, we can capture specific dishonest profiles: children who would not cheat or lie, others who would cheat but not lie, some who would cheat and lie just once, and others who would cheat and lie twice. Furthermore, we focus on embedding the advanced ToM in the deceptive game in order to capture the same reasoning process entailed by the individual measures of ToM. This way, we enhance the complexity of the previous versions of TRP for school-age children and provide a more comprehensive image of children's propensity and proficiency to deceive in middle childhood.

Aim 4

Our last aim targets the practical implications of the current thesis (***Study 1***). Some legal contexts require clear discrimination between knowledgeable and unknowledgeable subjects using reliable tools. Previous literature focused on deception detection in adults, allocating immense resources to design tools meant to expose subjects holding relevant information. These instruments were exclusively designed for adults, with few attempts to make them child-friendly (Visu-Petra et al., 2016). In Study 1, we aim to extend the limited research on ***adapting the Reaction Time Concealed Information Test*** (RT-CIT; Verschuere et al., 2015) ***for children*** (Visu-Petra et al., 2016). RT-CIT represents one of the most valuable and empirically sound tools worldwide for detecting subjects holding relevant information, used in practice by several countries, such as Japan. We address the longitudinal reliability of RT-CIT between two-time points, employing different scenarios requiring children to deny possessing critical information. Validating the re-administration of this child-friendly adaptation of RT-CIT can have significant implications for the legal interviewing settings since repeated interviewing of vulnerable subjects (e.g., children) is one of the most challenging issues in the field (La Rooy et al., 2009).

CHAPTER III. ORIGINAL RESEARCH CONTRIBUTIONS

Study 1: A longitudinal investigation of children's ability to withhold information in an adapted RT-CIT paradigm

3.1.1. Introduction[8]

A growing body of evidence suggests that the ability to "bend the truth" is an important developmental achievement, following an intensive development from the first year of age, shaped by individual differences in various socio-cognitive factors (Talwar & Crossman, 2011; Visu-Petra et al., 2022). Ekman (1985) distinguished between two types of dishonesty: concealment and falsification. When someone conceals information, they knowledgeably withhold relevant information without necessarily fabricating statements. Other scholars have equated this with "secrecy", which inherently involves intentional hiding or concealment (Bok, 1983), being essential to social development based on the "social contract" established with others and the commitment not to reveal certain information (Anagnostaki et al., 2013; Gongola et al., 2021). A recent integrative model (Slepian, 2022) defines secrecy as the action (active concealment) but also the intention to keep information unknown by one or more others, specifying that the enactment phase requires "monitoring, expressive inhibition, and alteration, which consumes regulatory resources" (p. 1). To keep the information unknown to others, children may choose to employ different alteration behaviors, such as diverging the discussion to other topics or distracting the interlocutor's attention. In more extreme cases, they could also rely on deception to ensure secrecy (Slepian, 2022). This sets the stage for the current study, in which we investigated

[8] The content of this sub-chapter is currently a manuscript submitted in the *Journal of Applied Research in Memory and Cognition*. The authors are Visu-Petra, L., Millen, A. E., Lee, A., Buta, M. & Prodan, N.

children’s ability to keep a secret by simply denying the recognition of relevant stimuli in relation to their executive/regulatory resources and emotional development.

Developmental evidence shows that children begin to understand the power of secrecy from age 5, differentiating between secrets and non-secrets based on their content and their mentalizing abilities (theory of mind; Anagnostaki et al., 2010; Pipe & Goodman, 1991). Theory of mind (ToM) is the ability to understand others’ mental states and emotions, allowing children to anticipate the contexts in which keeping a secret is important (e.g., in friendships; Corson & Colwell, 2013). Moreover, Colwell et al. (2016) found that preschoolers who passed the ToM tasks had more provided more details about secrets and hiding places than their counterparts who had a lower ToM performance, demonstrating a more nuanced understanding of it. Recently, Lavoie and Talwar (2020) found that lower ToM predicted the disclosure of a secret to parents.

As another potential mechanism underlying children’s ability to conceal information, executive functions, such as inhibitory control and shifting, were proved to facilitate children’s accuracy and reaction times when questioned about concealed information (Visu-Petra et al., 2016). Executive functions are central to the ability to successfully inhibit the tendency to tell the truth while juggling truthful and untruthful information in memory, this being particularly challenging for children (Williams et al., 2016; Sai et al., 2021). Recent findings also suggest that lower working memory performance was indicative of children’s higher propensity to reveal a secret to a parent (Lavoie & Talwar, 2020).

Depending on the social context, children may choose to conceal information for self-serving (e.g., concealing a minor transgression – the toy break paradigm; Williams et al., 2020) or others-oriented purposes (prosocial concealment – the surprise scenario; Peskin & Ardino, 2003). In both types of concealment, evidence suggests that older children (e.g., 9 years-olds) were more likely to conceal the relevant information than younger ones (e.g., 4 years-olds; Lavoie & Talwar, 2020; Williams et al., 2020). In addition, the complexity of children's concealment may vary from simple denials regarding a transgression to more sophisticated statements demonstrated in conversations or interviews (Talwar & Lee, 2008). The current study focuses on school-aged children's ***simple non-verbal denials*** regarding the possession of incriminatory/revealing evidence when directly confronted with relevant stimuli in an adapted *Reaction Time Concealed Information Test* paradigm (RT-CIT; Verschuere et al., 2015).

Seminal approaches to lie detection build upon the cognitive view of deception that concealing information imposes a higher cognitive load than telling the truth resulting in an appended time specific to dishonesty (Suchotzki et al., 2017). Previous research on deception in children has demonstrated that it takes longer for children to conceal than confess, depending on the type of question asked (recall vs. recognition questions; Ahern et al., 2011; Williams et al., 2019). In addition to basic executive functions, higher levels of socio-emotional traits such as anxiety also influence the speed of deceptive responses in adult samples. For high-anxious knowledgeable participants, their attention may be disrupted by their increased emotional activation when confronted with incriminatory details, which led to more prolonged RTs (Giesen & Rollison, 1980; Visu-Petra et al., 2012). Despite such preliminary evidence, to our knowledge, the effect of individual differences in executive functions, theory of mind, and emotional traits has not yet been systematically investigated in relation to the concealment of information in children.

To achieve our aim, we utilize the *Reaction Time Concealed Information Test* (RT-CIT; Ben-Shakhar & Elaad, 2003; Lykken, 1959; Verschuere et al., 2011), which is a well-validated memory paradigm used to detect concealed knowledge of items relevant to a mock crime scenario. Such concealed information about critical items encountered during the mock crime (i.e., probe items) was introduced to the subjects sparingly, along with other pieces of irrelevant information (i.e., irrelevant and target items). Then, response times for probe items are compared to those for irrelevant ones (e.g., klein Selle & Ben-Shakhar, 2023). The theoretical underpinnings of CIT have been explained by various theories over time (e.g., klein Selle et al., 2018), but the most influent of all is considered the *Orienting Response (OR)* theory (Sokolov, 1966). OR refers to physiological and behavioral responses elicited by novel and significant stimuli (klein Selle & Ben-Shakhar, 2023). The "CIT effect" relies on this theory in the sense that relevant items (probes) carry a special significance for individuals that encountered them before (knowledgeable subjects), which leads to an enhanced physiological/behavioral orienting response when presented with those stimuli (e.g., higher reaction times; Meijer et al., 2014). In adults, slower response times to probes have successfully discriminated concealed knowledge (Geven et al., 2020; Kleinberg & Verschuere, 2015; Verschuere et al., 2018; Visu-Petra et al., 2012). To our knowledge, the only attempt to create an adapted version of the RT-CIT for children was made by Visu-Petra and colleagues (2016). In their study, children were invited to participate in a first-person perspective *surprise scenario*, where they were asked to keep a secret and deny the recognition of specific items to preserve a gift as a surprise for a child. This was used to verify the reliability of the RT-CIT in discriminating between knowledgeable children (those possessing the relevant information) and unknowledgeable ones. Results showed that RT-CIT could be considered a reliable tool for detecting concealed information by early school age. Furthermore, cognitive (executive functions) and emotional (internalizing/externalizing symptoms) correlates were also investigated in relation to children's RT-CIT performance. Executive functions (e.g., inhibitory control, shifting, verbal and spatial working memory) were shown to be significant predictors of children's proficiency in concealing information. As for the emotional factors, the results indicated that children who manifested more attention problems and OCD symptoms were less accurate in their responses to irrelevants.

3.1.1.1. The Current Study

The current study extends the very limited existing literature on detecting concealed information in children using the RT-CIT (Visu-Petra et al., 2016) in several directions. First, it verifies, for the first time in the literature, the longitudinal reliability of the test by assessing children at two time points with distinct scenarios requiring them to deny the possession of relevant information for personal or prosocial reasons. This offers essential information for the possibility to re-administer the RT-CIT to previously knowledgeable participants, which to our knowledge, has not yet been tested even in adults. Second, it follows the potential socio-cognitive and emotional correlates of individual differences in the appended lie-RT across the two-time points by measuring interrelations with *baseline cognitive* (processing speed and short-term memory), *executive* (verbal and visuospatial working memory, inhibition, and shifting), *social* (theory of mind), and *emotional processes* (anxiety and depression symptoms). Based on preliminary evidence regarding the relationship between processing speed, short-term memory, and children's performance on RT-CIT (Visu-Petra et al., 2016), we anticipated that the baseline socio-cognitive, ToM and EFs are negatively associated with children's RTs and positively supporting their accuracy in the RT-CIT, based on previous work with adults/children showing that participants with higher EF have better deceptive skills (Varga et al., 2015; Visu-Petra et al., 2012; Visu-Petra et al., 2016).

Lastly, for the emotional correlates of children's deceptive behavior, we hypothesized that anxiety and depression are negatively associated with children's accuracy on RT-CIT and positively associated with their RTs, congruent with other studies on adults (Giesen & Rollison, 1980; Visu-Petra et al., 2012).

3.1.2. Method

3.1.2.1. Participants

Participants were 194 children tested twice, approximately one year apart. Children were assigned to one of the two groups: the Unknowledgeable group (Unknowledgeable, n = 97) or the Knowledgeable group (Knowledgeable, n = 97). In each group, children were 8-11 years old at the first time point (Unknowledgeable group – M = 113.25 months, SD = 8.33, 49 girls; Knowledgeable group – M = 113.83 months, SD = 15.56, 54 girls) and 9-12 years old at the second one (Unknowledgeable group – M = 124.75 months, SD = 8.35; Knowledgeable group – M = 125.34 months, SD = 15.58). Children's parents reported their educational level as a proxy for socioeconomic status (see Appendix 1 for a summary of the educational levels reported for both parents).

3.1.2.2. Materials

Children's Ability to Conceal Information

In order to test children's ability to conceal information via withholding evidence we used the Reaction Time Concealed Information Test (Seymour et al., 2000). Children from both experimental groups went through a different scenario at each time point, in which they endorsed a first-person perspective of the events.

At *Time 1*, children were told that a clown in their school was organizing a raffle with many surprise prizes. The most important rule of the raffle was that no participant was allowed to know what prizes the other participants received. However, children were explained that they managed to play a trick on the clown and peek at the prize received by another colleague. Thus, they were shown the content of their colleague's gift: a sharpener, pencils, a notebook, and a bag (*probe* *items*). After inspecting each item, they put everything back and were asked to describe each object. If the child could not provide at least 2 representative features of each probe item, all the probes were displayed again. Participants were instructed not to tell anyone that they saw the gift to avoid getting punished by the clown for peeking. In order to make sure that they were keeping the secret regarding the content of the gift, children were asked to explain why they couldn't tell anyone about it.

After a short break, in which we administered the Inhibition and Shifting tasks, children were presented with a new set of items representing their own gift from the raffle (another set of a sharpener, pencils, notebook, and bag – *target items*). Children from the Unknowledgeable group started the session with the Inhibition and Shifting tests described below, after which the target items were presented. Starting with this stage, the procedure was identical for the Knowledgeable and Unknowledgeable groups. Again, participants were asked to look closely at each item and describe it (with at least 2 physical features). In the end, the children were told that the clown found out that some of the children broke the raffle's rule and that they would show them some pictures on the computer with the objects from other prizes than their own and ask them if they recognized them. The task was presented using the E-PRIME software, displaying pictures of the items from the surprise scenario, the target items, and irrelevant items (new but related pictures). The task encompassed 3 blocks of trials, with two practice blocks. Children were instructed to answer Yes (for the recognition of the item) by pressing the ALT key which was marked with green tape as fast as possible when they saw one of their own gift objects (target item) because they were allowed to see them. When participants were shown any other item (*irrelevant item* – an item that the children have not seen before; or *probe item* – which only the children in the Knowledgeable group had seen before) they were instructed to press the CTRL button in order to deny the recognition of those items as fast as possible. The probes items were not explicitly mentioned, so the instructions could remain identical for both groups. This way, we did not specifically instruct knowledgeable children to deny probe items. The instructions were repeated before each block of trials to ensure children's understanding of the rule.

In the first practice block, children were presented with 11 practice trials without any time limitation. The second practice block contained 2 series of 6 trials each. This time, children had 3000 ms. to press one of the buttons for each item displayed (answering Yes or No). If the time limit was exceeded, an hourglass appeared on the screen warning participants of their response latency. The child received trial-by-trial feedback regarding their response accuracy for both practice blocks. This was employed by showing a green 'tick' sign if their response was accurate or a red X if it was not. After the two practice blocks, the experimental testing block began, informing children that they would no longer receive feedback on their answers.

During the final test block, 4 probe items, 4 target items, and 16 irrelevants were randomly shown 4 times (96 stimuli in total). If the child did not respond to each item displayed in time, an hourglass appeared, followed by the next stimulus. We recorded participants accuracy and reaction times for each item.

At *Time 2*, children were told to imagine that they had a new photography class at school and that their aunt and uncle wanted to buy them a gift. Given this, they went to a store and chose some useful items for this class for their aunt to buy later (batteries, a bag for the photo camera, a photo album, and a memory stick – *probe items*). Again, children were instructed to look closely at each object and then to describe them afterward by mentioning at least two representative physical features for each of them and to look again at the items if not.

After the usual break in which Inhibition and Shifting tasks were administered, children were told that, unfortunately, their aunt went to that store and bought other objects that looked different from those that they had initially chosen because the saleswoman from that day did not know about the items they wanted. Then, they were asked to visually inspect on the computer screen pictures of the items bought by their aunt (other batteries, bag for the photo camera, photo album, and memory stick - *target items*) and to describe them afterward. After that, the children were explained that because they did not like the objects received from their aunt, they went to the store and exchanged them with the ones they initially preferred. The Unknowledgeable group began their RT-CIT scenario by looking at and describing the target items without mentioning the probe items. Both experimental groups were told that they went to visit their aunt and uncle after a while. The uncle, who did not see which objects they received as a gift, asked them about the present by showing them some photos of objects to see if they would recognize the ones from the gift. To spare their aunt's feelings about changing her gift, they were required to keep the secret about exchanging the gift and answer Yes as fast as possible when they saw one of the items bought by their aunt (*target item*) and to answer No when they were shown any other item (*irrelevant* or *probe items*).

The practice and the experimental blocks followed the same structure as the RT-CIT task used at Time 1.

Executive Functions

Processing Speed. Processing speed was evaluated using the Simple Reaction Time test (SRT) from CANTAB (Owen et al., 1990), in which a square was shown on the screen at different intervals, requiring children to select the button on a press pad to register their response as soon as possible. The outcome measures constituted their response speed, correct responses, and errors of commission and omission.

Short-Term Memory. In order to assess children's short-term memory, the Forward Digit Span was used. Children were asked to repeat 6 series of 3, 4, 5, 6, and 7 digits that the experimenter read to them. Children received one point for each correct series, the final score being calculated based on the total points accumulated.

Verbal and Spatial Working Memory. Backward Digit Span, used to evaluate children's *verbal working memory*. The principle for this task is similar to the one described for Forward Digit Span, except that this time children had to repeat the digits in reverse order for each series. *Spatial working memory* was evaluated through The Spatial Working Memory test (SWM) from CANTAB (Owen et al., 1990), which required retention and manipulation of visuospatial information. Children had to conduct a strategic search to find the hidden yellow tokens from the items displayed on the screen (with a variation of items from three to eight). They had to remember that a token could not be found in a box in which they already found another one. Therefore, re-checking a location while looking for a new item was coded as a between error, whereas re-checking a location where no token was hidden before was coded as a within error. The final scores also included a strategy score, with higher values indicating poorer strategy.

Inhibitory Control and Shifting. The Inhibition and Shifting tasks from NEPSY II (Developmental Neuropsychological Assessment; Korkman et al., 2007) were used at all testing time points to measure children's ability to inhibit a prepotent response and, respectively, to flexibly switch between different demanding. The Inhibition trial entailed a sequence of black and white geometrical shapes that children had to name by indicating the label of the opposite shape (i.e., they were instructed to say ‘circle’ when seeing a square, and ‘square’ when seeing a circle).

The same shape display was used for the Shifting trial, in which children were required to say the correct name for the black shapes while providing the opposite name for the white shapes (i.e., 'square' for a black square, and 'circle' for a white square). The same protocol was employed in a second display containing upward and downward pointing arrows.

We recorded children's time for completing each set of shapes as well as the number of corrected and uncorrected errors. The total number of errors (the sum of corrected and uncorrected errors) for inhibition and shifting was computed and used as independent variables.

Theory of Mind

Theory of mind ability was measured at Time 1 using the Social Perception subtest from the Developmental Neuropsychological Assessment II (NEPSY II; Korkman et al., 2007). This included the Verbal and Contextual tasks. In the verbal task, participants were read several scenarios and shown pictures depicting different social experiences. The scenarios were meant to assess their understanding of others' intentions, beliefs, or emotions. The contextual task measured children's ability to relate various social settings to appropriate emotional reactions of those experiencing them. To this end, they were shown pictures depicting different social situations in which the face of the individual experiencing them was not shown. Participants were asked to choose from different facial expressions the most appropriate one to represent the character's feelings in each situation. We calculated separate verbal and contextual ToM scores and a composite total score. We excluded ToM measurements at Time 2 based on the lack of associations between children's RT-CIT performance and ToM scores at Time 1.

Internalizing Symptoms

Children's internalizing problems were assessed using the child version of the Revised Child Anxiety and Depression Scale (RCADS-C, Chorpita et al., 2005) adressing children's anxiety and depression symptoms. The questionnaire contained six subscales: Generalized Anxiety Disorder (GAD), Obsessive-Compulsive Disorder (OCD), Separation Anxiety Disorder (SAD), Panic Disorder (PD), Social Phobia (SP), and Major Depressive Disorder (MDD). Based on these subscales, we calculated a Total Anxiety Score (sum of the 5 anxiety subscales, with a maximum score of 111), a Total Depression Score (maximum score of 30), and a Total Internalizing Score (maximum score 141).

3.1.2.3. Procedure

Across timelines, parental consent was initially obtained. Next, children with parental consent completed the RCADS-C questionnaire and underwent two individual testing sessions, where the tasks were applied in a particular order. In the first session, children were introduced to the executive functioning tasks from the Cambridge Neuropsychological Test Automated Battery (CANTAB), administered using a Paceblade Tablet with a touchscreen. These computer tasks were followed by the Forward Digit Span and Backward Digit Span tests. The second session started with the surprise scenario. During the secret-keeping scenario break, the Inhibition and Shifting tasks from the Developmental Neuropsychological Assessment (NEPSY II, Korkman et al., 2007) were administered. After the secret-keeping scenario, the RT-CIT was administered.

3.1.2.4. Statistical Analysis

To assess whether performance on the CIT task was influenced by whether participants were in the knowledgeable or unknowledgeable group, we conducted linear mixed effects models to assess reaction time and binomial mixed effects models to assess accuracy. Both types of analyses were conducted in R using the lme4 (Bates et al., 2015) and lmerTest (Kuznetsova et al., 2017) packages. Separate models were conducted for each time point (Time 1 and Time 2). Predictors in each model were effect-coded and included knowledge condition (.5 =

knowledgeable, - .5 = unknowledgeable), stimuli type (.5 = probe, -.5 = irrelevant), and the interaction between the two. Random effects were specified for each participant, each stimulus, and, when appropriate, across testing sessions (Time 1 or Time 2). Random slopes were specified maximally according to Barr et al. (2013) and Barr (2013). For full model details, including the estimated random effects, see the supplementary materials.

To assess whether individual differences in executive functioning or internalizing/externalizing symptoms influenced reaction time on the CIT task, we first conducted a Principal Components Analysis across all executive functioning and internalizing/externalizing symptoms measures to reduce the multiple measures to two components. Descriptive statistics are reported in Table 1 and factor loadings are reported in Table 2. Component 1 represented executive functioning, with greater scores indicating greater executive functioning, while Component 2 represented the internalizing symptoms, with greater scores indicating greater anxiety/depression. Combined, both components explain 46% of the total variance in the individual differences scores. These component scores (and their interactions) were added as additional predictors in a linear mixed effects model along with knowledge condition and stimulus type. While here we report the model where reaction time was the outcome variable, we also conducted an additional model where participant detection efficiency score was used as the outcome variable; this did not change the pattern of results and, therefore, is not reported here. Also, additional models were run for each individual difference measure separately, though similarly, the overall pattern was consistent with the PCA model and, therefore, not reported here. For full details on all additional analyses conducted, see the supplementary materials. Finally, we note that while we attempted to conduct binomial mixed effect models to assess the influence of executive functioning and internalizing/externalizing symptoms on accuracy on the CIT task, these models failed to converge, likely due to the overall high accuracy of participants on the task. For this reason, we only report models with reaction time and not accuracy.

Table 1. *Descriptive Statistics*

Variable	**Time 1**		**Time 2**	
	M	*SD*	*M*	*SD*
Simple Reaction Time				
Response Speed	385.67	97.65	356.98	74.59
Prop. Correct Responses	98.09	2.24	98.43	1.71
Forward Digit Span	23.27	4.63	24.82	4.86
Backward Digit Span	13.53	4.65	14.42	4.75
Nonword	14.73	3.60	15.10	2.77
Spatial Working Memory				
Errors	41.45	20.44	34.95	19.25
Strategy	35.33	4.70	34.60	5.10
Inhibition (Errors)	2.28	2.62	2.00	2.30
Shifting (Errors)	5.16	4.49	4.36	3.74
Internalizing symptoms				
Anxiety	29.04	16.88	26.51	15.24
Depression	36.32	21.07	32.51	18.31
Contextual theory of mind	4.61	1.12	-	-
Verbal theory of mind	17.82	2.75	-	-
Theory of mind total score	22.43	3.10	-	-

Table 2.

Factor Loadings for the Principal Components Analysis that Included the Individual Differences Measure

	Executive Functioning Component	Internalizing Symptoms Component
Simple Reaction Time		
Response Speed	**-.47**	-.05
Prop. Correct Responses	**.32**	-.06
Forward Digit Span	**.65**	-.08
Backward Digit Span	**.72**	-.08
Nonword	**.64**	-.04
Spatial Working Memory		
Errors	**-.72**	-.05
Strategy	**.69**	-.03
Inhibition (Errors)	**-.36**	.18
Shifting (Errors)	**-.48**	.03
Internalizing symptoms		
Anxiety	.03	**.99**
Depression	.04	**.99**

Note: Factor loadings greater than .30 are in bold

3.1.3. Results

Reaction Time

As shown in Table 3, a linear mixed effect model found that at Time 1 there were significant main effects of stimuli type (probe vs irrelevant) and knowledge condition (knowledgeable, unknowledgeable), such that RTs were slower for the probe items compared to irrelevant items and for children in the knowledgeable group compared to the unknowledgeable group respectively. A significant interaction confirmed that RTs were significantly slower to the probe compared to the irrelevant stimuli for participants in the knowledgeable condition, but that there was no difference for participants in the unknowledgeable condition (see Figure 1).

Similarly, the pattern of results for data collected at Time 2 were identical to that collected at Time 1. There were significant main effects of knowledge condition and stimuli type on reaction time, and a significant interaction such that reaction times were slower for the probe items for participants in the knowledgeable group compared to the other three conditions. See Table 3. and Figure 2. In addition, reaction times were faster in Time 2 compared to Time 1. This was particularly true for responses from participants in the knowledgeable group compared to those in the unknowledgeable group.

Table 3.

Fixed Effects Estimates for the Model Predicting Reaction Time on the CIT Task at Time 1.

	Estimate (Std. Error)	*t*-value (approx. *df*)	p-value
Intercept	870.01 (15.87)	54.82 (117.58)	< .001***
Stimuli Type	70.23 (18.81)	3.73 (18.81)	.001**
Condition	106.84 (27.62)	3.90 (197.74)	< .001***
Stimuli Type x Condition	108.37 (20.87)	5.19 (27.21)	< .001***

Figure 1.

Reaction Time for Stimuli Type and Knowledge Condition at Test Session 1.

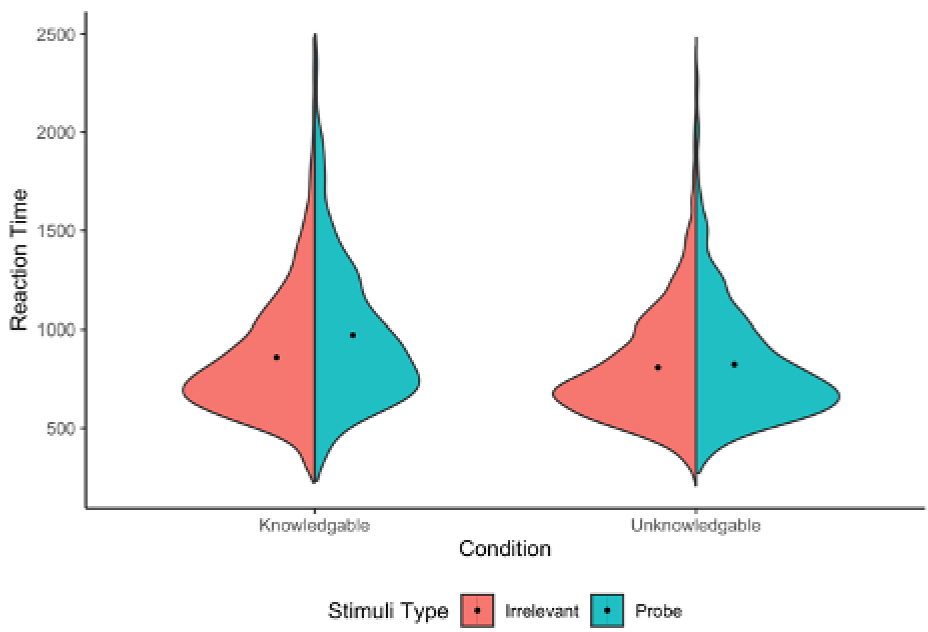

Table 4.

Fixed Effects Estimates for the Model Predicting Reaction Time on the CIT Task at Time 2.

	Estimate (Std. Error)	*t*-value (approx. *df*)	p-value
Intercept	743.42 (14.95)	49.42 (46.42)	< .001***
Stimuli Type	92.94 (23.93)	3.88 (19.85)	< .001**
Condition	133.61 (19.90)	6.71 (189.48)	< .001***
Stimuli Type x Condition	134.80 (17.31)	7.79 (41.06)	< .001***

TOPAN MIHAELA
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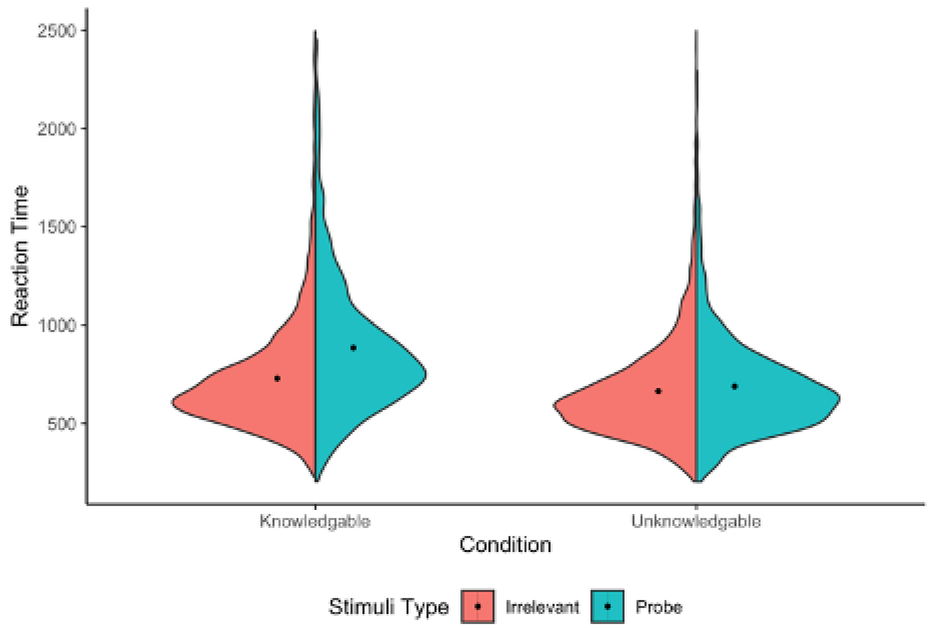
Figure 2.

Mean Reaction Time for Stimuli Type and Knowledge Condition at Time 2.



Accuracy

Overall, for Time 1, accuracy was high (see Figure 3). Similar to the findings with RTs, as shown in Table 5, we found two significant main effects of stimuli type and knowledge condition, such that accuracy was lower for the probe items compared to irrelevant items, and for children in the knowledgeable group compared to the unknowledgeable group. Also consistent with the RT findings, there was a significant interaction between the two, such that children in the knowledgeable group were less accurate for probe items. Essentially, children were more prone to making mistakes when they denied knowledge of something they knew.

Findings for accuracy at Time 2 were also identical to what was found in Time 1. As shown in Table 6, there were significant main effects of stimuli type and knowledge condition, such that participants were less accurate for probe items and those in the knowledgeable condition. There was also a significant interaction, such that participants in the knowledgeable condition were particularly less accurate when viewing probe items (see Figure 4).

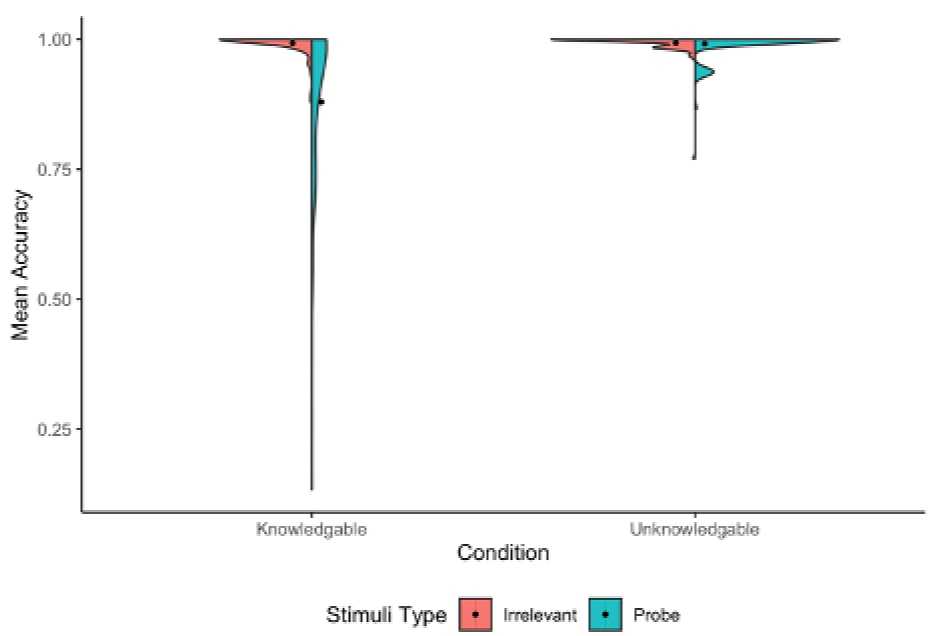
Table 5.

Fixed Effects Estimates for the Model Predicting Accuracy on the CIT Task at Time 1.

	Estimate (Std. Error)	z-value	p-value
Intercept	5.23 (.21)	24.37	< .001***
Stimuli Type	-1.76 (.27)	-6.60	< .001***
Condition	-1.56 (.37)	-4.26	< .001***
Stimuli Type x Condition	-2.98 (.52)	-5.69	< .001***

Figure 3

Mean Accuracy for Stimuli Type and Knowledge Condition at Time 1.



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2023.10.16 13:33

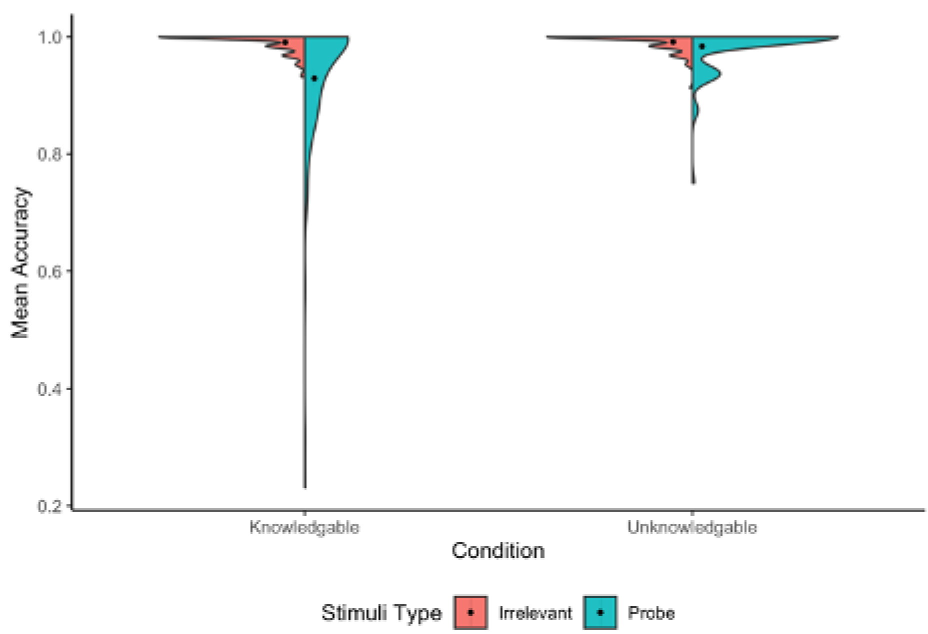
Table 6

Fixed Effects Estimates for the Model Predicting Accuracy on the CIT Task at Time 2.

	Estimate (Std. Error)	z-value	p-value
Intercept	4.85 (.18)	26.89	< .001***
Stimuli Type	-1.32 (.25)	-5.23	< .001***
Condition	-.90 (.31)	-2.92	.003**
Stimuli Type x Condition	-1.67 (.57)	-2.92	.003**

Figure 4

Mean Accuracy for Stimuli Type and Knowledge Condition at Time 2.



TOPAN MIHAELA
2023.10.16 13:33

Detection Efficiency

Group Level

Going beyond the traditional analyses of raw response latencies (Faust et al., 1999), z-score transformations were employed. This was conducted by subtracting the mean of one probe item and four irrelevant items from the probe response and dividing it by the standard deviation of the five values (Ben-Shakhar, 1985; Meijer et al., 2007). We obtained a score for each question and then averaged them to produce a single deception score for the RT-CIT.

According to the signal detection theory, the efficiency of detection may be assessed by analyzing the degree of separation between the the detection measure's distributions for the experimnetal conditions (Unknowledgeable and Knowledgeable). Following the recommendations proposed by Carmel et al. (2003), we computed our signal detection parameters by comparing the Knowledgeable and Unknowledgeable gropus. After we calculated the distance between the centers of the two distributions (d'), the area under the receiver operating characteristic curve – AUC was derived (Ben-Shakhar & Elaad, 2003). Its value can vary between 0 and 1 (perfect detection level), with 0.5 being the chance value (Hu & Rosenfeld, 2012). Table 7 reveals the d' and AUC values for the RT-CIT across timelines.

Table 7.

Means, Standard Deviations, Standardized Differences (d'), and the Area Under the Curve (AUC) for the RT-CIT Across Timelines.

Time	Mean z Knowledgeable	SD Knowledgeable	Mean z Unknowledgeable	SD Unknowledgeable	d'	AUC	95% CI LL	95% CI UL
Time 1	0.31	1.31	0.06	0.44	0.25	0.571	0.432	0.709
Time 2	1.41	0.43	1.14	0.55	0.53	0.646	0.574	0.718

Intra-Individual Level

For more comprehensive intra-individual testing of probe versus irrelevant differences, reaction time data for each Knowledgeable subject were bootstrapped (Wasserman & Bockenholt, 1989), and hit rates were subsequently calculated. The bootstrapping analysis allows for generating multiple averages from the same set of stimuli (Meijer et al., 2007). After excluding the incorrect behavioral responses and possible artifacts, a computer software drew a set of individual probe and irrelevant reaction times equal to the number of accepted probe/irrelevant trials in each block. Then, a difference score is computed by subtracting the mean irrelevant RTs from the mean probe RTs. In line with Verschuere et al. (2009), this process was repeated 500 times, resulting in a distribution of 500 difference scores. According to previous research, if the mean difference score minus 1.29 times the standard deviation is higher than zero, it can be concluded that the probe RTs are slower than the irrelevant ones, and as such, the subject has been detected as being knowledgeable (Visu-Petra et al., 2012).

The bootstrapping of the CIT reaction times provided a hit rate of 59% for T1, and 75% for T2.

Do Individual Differences in Executive Functioning and Internalizing/Externalizing Symptoms Influence Performance on Task?

As an initial check, we tested whether the executive functioning component from the PCA improved between test sessions. Indeed, as we could expect, executive functioning was higher at Time 2 compared to Time 1, indicating that, generally, executive function improved as children got older.

Fixed effects estimates for the model, including the PCA components, are reported in Table 3.1.7. Theory of mind scores were excluded from the final model due to their weak correlations with detection efficiency scores the RT-CIT (see Table 2 from Appendix A). While the executive functioning component had a significant main effect on RTs, such that greater executive functioning led to overall faster responses, there was no significant interaction between the executive functioning component, stimulus type, or knowledge condition. Individual analyses revealed that the effect of the EF component on reaction times was driven by the Simple Reaction Time latency measure (Simple Reaction Time latency). ToM and the anxiety and depression component also did not influence responses on the CIT task. This would suggest that performance on the CIT task can robustly detect when participants are concealing knowledge, being less vulnerable to the influence of individual differences in children's cognitive and emotional development.

Table 8.

The Fixed Effects Estimates for the Model Predicting Reaction Time that Includes the Executive Functioning and Internalizing Symptoms Components

	Estimate (Std. Error)	*t*-value (approx. *df*)	p-value
Intercept	791.23 (64.11)	12.34 (1.06)	< .045*
Stimuli Type	76.00	5.09 (42.75)	< .001***
Condition	142.26 (35.41)	4.02 (4.50)	.013*
Stimuli Type x Condition	117.28 (15.73)	7.45 (60.76)	< .001***
Executive Functions Component	-67.48 (21.06)	-3.21 (17.51)	.005**
Stimuli Type	-1.15 (6.21)	-.19 (61.93)	.853
Condition	-10.77 (38.45)	-.28 (122.76)	.780
Stimuli Type x Condition	-4.74 (15.68)	-.30 (1.66)	.796
Depression/Anxiety Component	-12.83 (22.08)	-.58 (3.62)	.596
Stimuli Type	-13.69 (8.72)	-1.57 (1.14)	.338
Condition	2.85 (47.99)	.06 (2.65)	.957
Stimuli Type x Condition	-5.69 (14.09)	-.40 (1.09)	.751

3.1.4. Discussion

The current study addressed the limited literature on RT-CIT's efficiency in school-aged children, attempting to longitudinally extend the preliminary results obtained by Visu-Petra et al. (2016). For the first time in the literature, we explored the possibility of re-administering the RT-CIT in children (and to our knowledge, in adults too). To this end, we tested its reliability between two-time points in which participants were subjected to different incriminating scenarios meant to make them deny the possession of relevant information for self- or other-oriented reasons. This can have major practical implications for the legal contexts in which repeated interviewing about incriminating details might be needed (La Rooy et al., 2009). On the other hand, we investigated the extent to which children's performance on the RT-CIT correlates with various socio-cognitive and emotional measures, such as *baseline cognitive* (processing speed and short-term memory), *executive* (verbal and visuospatial working memory, inhibition, and shifting), *social* (theory of mind), and *emotional processes* (symptoms of anxiety and depression). Broadly, we anticipated that the socio-cognitive processes included (baseline cognitive processes, ToM, and EF) would negatively predict children's RTs. In contrast, the symptoms of anxiety and depression would be a positive predictor of their RTs on the test. Also, the mirrored relations were expected in association with children's accuracy in concealing information, the socio-cognitive correlates being a positive predictor for it, whereas anxiety and depression negative ones.

In order to be effective, the RT-CIT needs to accurately discriminate between subjects' reactions to incriminating details and those to new, irrelevant information. In line with previous research on children, our data from Time 1 and Time 2 demonstrated that RTs were significantly slower to the probe than the irrelevant stimuli for participants in the knowledgeable condition, indicating the recognition effect (Visu-Petra et al., 2016). However, there was no difference between RTs to probes and irrelevants for participants in the unknowledgeable condition. The same pattern of results was also obtained for children's accuracy in concealing information - participants in the knowledgeable group were less accurate for probe items than for the irrelevant ones compared to their unknowledgeable counterparts. In line with previous evidence on younger school-aged children (Visu-Petra et al., 2016), RT-CIT proved to differentiate between children who withhold evidence and those who were not, based on their accuracy and response latency. Based on the group-level analysis of deception efficacy initially proposed by Seymour et al. (2000), current results showed that the value of the AUC for Time 1 was .57 and .64 for Time 2, which is lower than previous results in children and adult samples (e.g., .74 for Visu-Petra et al., 2016; .93 for Varga et al., 2015). This could be explained by the high levels of variability in younger children's RTs, which was previously documented (Kiselev et al., 2009; Mella et al., 2015). Previous research argues that age differences in RT intraindividual variability present the inverse U-shape, with children and elders showing the greatest intraindividual variability, reflecting fluctuations in attentional processes (Hultsch & MacDonald, 2004; Mella et al., 2015). Moreover, research on children's deceptive responses shows that their difficulties in producing fast false responses are particularly present when addressing recall rather than recognition questions (Williams et al., 2019). In this case, knowledgeable children were presented with images of different categories of items (probes, irrelevants, and targets) and instructed to deny recognizing the incriminating images (i.e., probe items). It is plausible that RT-CIT failed to classify some of the children from the knowledgeable group as being deceptive due to their high intraindividual variability in conjunction with the fact that denying the recognition of probe items was not that challenging. However, the intra-individual analysis yielded significant hit rates, in line with previous literature (59% for Time 1 and 75% for Time 2 compared to 53% for Visu-Petra et al., 2016; 56% for Verschuere et al., 2009).

As for the ***individual differences*** that could explain children's performance on the RT-CIT, the present study demonstrated that *processing speed latency* was the only cognitive correlate that significantly explained children's performance in the RT-CIT. More specifically, our data showed that greater processing speed led to overall faster responses, but there was no significant interaction between the processing speed, stimulus type, or knowledge condition. Perhaps a higher processing speed allowed children to make better and faster decisions regarding what key to press to successfully withhold incriminating evidence, helping them overcome the cognitive load imposed by the task (Bond, 2012). Moreover, previous literature shows that processing speed mediates the relation between age-related differences and decision-making (Henninger et al., 2010). At the same time, Galil et al. (2021) posited that in order to employ a fast response for self-serving purposes, one must process all the relevant information rapidly: both the correct response and the benefitting alternative option. In the current study, higher processing speed helped children assess all the options and respond accordingly irrespective of their experimental condition.

However, our results showed no relationship between the EF component and response latency and accuracy. In this respect, Tabatabaeian et al. (2015) proposed that when a self-serving condition appears, decisions with a high probability of being dishonest take less time, and as such, participants express less hesitation to be dishonest. We did not obtain a difference between knowledgeable and unknowledgeable children either in terms of their EFs, which might be due to the nature of the RT-CIT task. Given the imagined scenarios, maybe the stakes were not high enough to discriminate between guilty and innocent participants. Moreover, the surprise scenario from Time 2 implied prosocial dishonesty, the motivation for withholding the evidence relying on spearing one’s feelings. We also suspect that given the recognition nature of the RT-CIT task, this may have eased the executive functioning demands (especially regarding working memory); previous research argued that children are having more trouble falsifying a response in recall tasks rather than recognition tasks (Ackerman & Koriat, 2011; Williams et al., 2019). Williams et al. (2019), for example, found no relation between young children’s false statements and their inhibitory control performance because of the deceptive task used (children were instructed to say they had a bird regardless of whether they saw pictures of birds or fish). An alternative explanation would rely on the different demands imposed by the RT-CIT compared to the EF tasks. Previous research distinguished between inhibitory tasks tapping into delays vs. active conflicts (Carlson & Moses, 2001). Due to its repetitive, non-verbal nature, the RT-CIT allowed for a response suppression strategy, which demanded a minimal inhibitory control. Response suppression implies simply withholding a prepotent response in favor of another (Nigg, 2000), which could lead to an "attentional inertia" state which would involve participants simply pression the YES/NO keys (Diamond, 2013). More so, children had to opportunity to press the NO key 80 times across trials, whereas the switch to the YES key was made only 16 times for responding to the target items. In contrast, some of the EF measurements, such as the inhibition and shifting task, tapped more into the attentional control processes, which are more cognitively demanding than response suppression (Diamond, 2013). Lastly, the meta-analysis of Sai et al. (2021) demonstrated that EFs’ association with children’s dishonesty was grater for the relationship with children’s ability to maintain their lies though elaborate statements than the relationship with their initial lies. In the current investigation, knowledgeable children needed to simply deny the recognition of the probe items by pressing a key, which would entail rudimentary forms of non-verbal deception, which lowered its association with EFs. Moreover, other findings suggest that inhibitory control, for example, was not significantly related to children's concealments as they were not required to fabricate elaborate utterances, which would tap more into their inhibitory abilities (Williams et al., 2020).

At odds with our predictions and previous literature, we found no association between children's ToM performances (verbal or contextual) and their ability to conceal relevant information in the TR-CIT paradigm. Similar to EFs, a possible explanation could reside in the different cognitive requirements. With the intention to keep the secret and deny the possession of relevant information, participants in the experimental condition needed to understand that the character questioning them in each imaginary scenario (e.g., the clown at Time 1 and the uncle at Time 2) are not knowledgeable of their actions (that they looked at other prizes at Time 1 and that they changed their aunt's gift at Time 2). Therefore, the characters would not know whether knowledgeable children were deceptively or honestly denying recognizing the probe items in the RT-CIT. This reasoning process would entail understanding knowledge access or first-order ignorance attribution, allowing children to realize that they can be deceptive without being discovered. Nevertheless, these are more rudimentary forms of ToM, different from what our ToM tasks from NEPSY assessed (e.g., understanding one's emotions related to a specific social setting), tapping into different mentalizing processes.

Lastly, the anxiety and depression component also did not influence responses on the CIT task, consistent with other results on adult samples (Visu-Petra et al., 2012). This would suggest that performance on the CIT task can robustly detect when participants are concealing knowledge, despite some participants being more prone to experience internalizing symptoms as a trait. However, it is worth mentioning that this could also be a consequence of the relatively artificial nature of the assessment context, with children being asked to imagine the surprise scenarios both times. As such, minor stakes were involved. Moreover, using a non-clinical sample of children might not have allowed substantial variation within the scores measuring anxiety and depression symptoms.

3.1.4.1. Limitations

Despite the notable findings regarding the RT-CIT efficiency in school-aged children, the present study has a couple of limitations. First, a possible limitation of this study is given by the deceptive context created that did not involve high stakes in order to highly discriminate between guilty and innocent participants. Moreover, children were evaluated in their schools. Such physical context can undermine children’s ability to immerse in surprise scenarios as they associate this environment with social conventions and norms, they are encouraged to follow early on (Harris & Nuntez, 1996). Second, we recruited a non-clinical sample, which could impact the relation between children’s RT-CIT performances and anxiety or depression symptoms. Perhaps in clinical samples, the effect imposed by these emotional problems can provide additional information about knowledgeable and unknowledgeable participants and their subsequent ability to withhold evidence.

3.1.4.2. Implications

The present study has clear implications for research and practice. On the one hand, we provided further evidence that RT-CIT can be a reliable tool for the contexts in which children attempt to conceal the possession of relevant information, either for self- or other-directed goals. However, looking at its modest diagnostic power revealed by the present study, more evidence is needed from children of different age ranges before it can be considered for systematic use in applied settings. On the other hand, the present results represent the first longitudinal attempt to study the reliability of RT-CIT in children, sustaining the possibility of being re-administered if needed. In line with previous research on multiple questioning in children, our results suggest that on Time 2, the detection efficacy on the group level was higher, with participants being better detected as knowledgeable than on Time 1. Similarly, O'Neil and Zajac (2013) demonstrated that children between 5 - 10 years old were less accurate the second time they were interviewed regarding a surprise event in which they took part. Moreover, Tabatabaeian et al. (2015) suggested that self-serving deception is more straightforward due to implied personal gains. In our case, the second time, children were immersed in a deceptive scenario with a prosocial motivation. As such, maybe this made their task to deny the possession of the incriminating evidence more difficult, as the tendency to hide the truth was not associated with explicit personal benefits.

Lastly, the current study provides additional evidence of the involvement of cognitive functions in children's ability to conceal information. In line with Visu-Petra et al. (2016), we replicated the processing speed's effect on children's RTs, showing that greater processing speed leads to overall faster responses. Further research using a wider variety of EF and ToM tasks, and potentially concurrent with the RT-CIT rather than seen as an individual difference – thus creating direct executive interference (see Visu-Petra et al., 2013) can help elucidate the role of EFs and ToM in supporting RT-CIT performance across the lifespan.

Study 2: Elementary second-order deception in school-age children and its socio-cognitive correlates

3.2.1. Introduction[9]

A growing body of research reveals that deceptive behavior represents a normative developmental milestone interwoven into the fabric of social relationships, even indicating a well-developed theory of mind and cognitive control (Talwar & Crossman, 2011). In order to deceive, children need to consider others' mental states as well as the social context. Past literature investigating children's ability to use verbal deception to obtain a reward relied on experimental settings in which the recipient was unaware of the participant's intention to deceive (Chandler et al., 1989; Ding et al., 2022; Hala et al., 1991). For example, the *hide-and-seek paradigm* was developed to investigate children's strategic deception, asking children to hide an object (e.g., a candy or a sticker) under one of the two cups. In order to win the game, the child had to lie about the true location either verbally or behaviorally by pointing to the opposite cup. In this task, the experimenter always followed the child's indications regarding the object's whereabouts, appearing unsuspecting about their intention to mislead them (Ding, Heyman, Sai, et al., 2018; Ding et al., 2022). To be successful, children only had to provide false information to mislead the experimenter.

When engaging in first-order deception (using counterfactual statements to deceive an unsuspecting target), the deceiver thinks that their statements are false and that the recipient is unaware of their intention to mislead (Visu-Petra et al., 2022). Nevertheless, sometimes the

[9] The content of this sub-chapter represents in its entirely the manuscript: Truthful, yet misleading: Elementary second-order deception in school-age children and its socio-cognitive correlates, published by Prodan, N., Ding, X. P., & Visu-Petra, L., in the year (2024), in the *Journal of Experimental Child Psychology*, *237*, 105759, https://doi.org/10.1016/j.jecp.2023.105759

interlocutor is aware of the others' deceptive intent. This can be especially true for highly competitive contexts, where people suspect that others may try to trick them (e.g., poker games) into gaining various advantages. Second-order lying, or "reverse psychology" as colloquially known, represents the ability to understand that the interlocutor is aware of one's deceptive intentions and to take advantage of this awareness. Consequently, the deceiver thinks that the target thinks they are telling a lie, so they would alternate between truthful and untruthful statements to mislead (Ding et al., 2014; Sai, Ding et al., 2018; Sai, Wu et al., 2018).

When the deceiver knows that the opponent is aware of their intention to deceive, they can construct truths and lies which can differ in complexity. In very competitive situations, if the deceiver has to fool the recipient repetitively across multiple occasions to gain an advantage, second-order deception could rely mostly on a simple, flexible adjustment to the opponent's cues. This would require lower executive functions and a rudimentary mental state understanding. Given its basic cognitive requirements, we conceptualize it as *elementary second-order deception,* where children have to fool the competitors into believing the opposite of their status (e.g., in games like Among Us/Werewolves that they are not the impostors/werewolves). Children are also exposed to contexts where they must maintain an initial lie to gain advantages. Previous literature consistently assessed this using the temptation resistance paradigm (TRP; Lewis et al., 1989). In this competitive situation, second-order lying would entail using truthful information to explain or sustain an initial statement that the deceiver knows to be false (e.g., "*I know the answer because I like watching science documentaries with my parents*"; Hu et al., 2020 - in response to being questioned about the knowledge that they acquired through cheating). While this information is true, it is used with the deceptive intent to maintain the initial lie regarding cheating behavior, anticipating that the experimenter would not know whether they are lying. This use of truthful information to deceive is more deliberated and recursive, which entails higher cognitive sophistication (Sai et al., 2021). Considering this, we conceptualize it as *advanced second-order deception*. So far, the literature has systematically investigated only elementary second-order deception in children and adult samples (Ding et al., 2014; Leng et al., 2019; Sai, Ding, et al., 2018). Even if children's maintenance of lies was well-documented (Evans & Lee, 2011; Lavoie et al., 2017; Talwar & Lee, 2008), it was not explored as the flexible alternation between various truths and lies to maintain an initial denial.

3.2.1.1. The Habituation Effect

Telling the truth has been widely considered an automatic output of our cognitive system (Spence, 2004), involving fewer cognitive resources (but see Street, 2015 for a more comprehensive discussion). Conversely, lie-telling is perceived as cognitively demanding, incurring higher temporal costs than truth-telling (Verschuere & De Houwer, 2011; Visu-Petra et al., 2012; Walczyk et al., 2005). According to the Activation-Decision-Construction-Action Theory (ADCAT) of deception (Walczyk et al., 2014), telling a lie is demanding due to the additional processes involved: Activation of truth, the Decision to lie, the Construction of the deceptive response, and the implementation of the lie (Action). Consequently, these additional processes can lead to liars taking more time to respond to a question than truth-tellers (Walczyk et al., 2005).

Another factor that could account for the time it takes to tell a lie versus the truth is the *habituation effect* which refers to how repeated/habitual the communication of a truth/lie needs to be to influence the subsequent communication of the lie/truth (Visu-Petra et al., 2014). Previous results revealed that when practiced repeatedly, lying "moves toward becoming the dominant response", interfering with subsequent acknowledgment of the truth (Verschuere et al., 2011).

Also, participants who practiced lying turned out to be more efficient liars than participants who practiced telling the truth in the training phase of an experiment (Van Bockstaele et al., 2012).

The research on a potential habituation effect in children's strategic deceptive behavior is virtually nonexistent, with no previous studies explicitly investigating it systematically. Nevertheless, indirect evidence from previous research investigations of preschoolers' deceptive abilities could indicate its existence from an early age. For instance, Sodian (1991) suggested that 3-years-olds were remarkably consistent in telling the truth to a competitor even under highly conducive conditions. This result was replicated in other samples, with a substantial cluster of preschoolers consistently failing to deceive the confederate in a zero-sum hide-and-seek game (Seucan et al., 2022). Nevertheless, in both studies, other children rapidly discovered how to deceive and employed it repeatedly across trials. In Seucan et al. (2022), the deceptive group performed steadily in all the sessions, with little variation in their deceptive pointing from one session to the other. Similarly, Sodian (1991) demonstrated that the 4- and 5-year-olds deceived the competitor constantly across trials. Unfortunately, all previous studies assessing children's deceptive behavior in the hide-and-seek paradigm used aggregated scores for children's performance, not a trial-by-trial response analysis, making any direct inferences from other paradigms challenging to test. In regards to school-age children's habituation with telling lies, to the best of our knowledge, there is no evidence documenting it.

Likewise, we could not identify any research investigating the presence of the habituation effect when considering second-order lying. From the perspective of the ADCAT (Walczyk et al., 2014), in first-order deception, the *Decision* component (to lie or not to lie) can become habituated since the goal to be deceptive or sincere can be constant across trials. In second-order deception contexts, whether we are telling truths or lies, the overall goal remains constant – to deceive the recipient, which does not impose additional cognitive load. Instead, what is changing is the strategy used to achieve that goal (using truths or lies to deceive). Consequently, the habituation in the case of second-order lying would involve the *Construction* and *Action* components of the ADCAT. In the *Construction* phase, the deceiver devises the most suitable deceptive strategy by inferring the other's ignorance about their moment-to-moment choice of a truthful or deceptive action. Different from first-order deception, engaging in second-order epistemic reasoning involves children's understanding that the opponent could be aware of their intention to deceive but, at the same time, unaware if the child is currently telling a lie. The corresponding *Action* component would involve flexibly delivering these lies most convincingly in a verbally truthful or deceptive manner.

3.2.1.2. Socio-Cognitive Factors Involved in Elementary Second-Order Deception

Past research demonstrated that second-order deception taxes similar cognitive abilities to first-order deception because both types of lying require the intention to mislead the other (Prodan & Visu-Petra, 2022; Ding et al., 2014). Nevertheless, only two studies investigated children's ability to tell truths and lies to mislead others for personal gain. The first study was conducted by Sai, Ding, et al. (2018) and investigated 4- to 6-year-old children's second-order lie-telling behavior in relation to their socio-cognitive development (e.g., second-order ToM and cognitive flexibility). Children's second-order lying was assessed using a modified version of the classic hide-and-seek paradigm. Children were instructed to play a zero-sum game in which they were told to hide a coin in one of their hands and prevent the confederate from guessing its whereabouts. In previous paradigm versions, the experimenter always looked for the object according to children's indications (eliciting first-order lying; Chandler et al., 1989; Ding et al., 2022; Hala et al., 1991). In the second-order lying paradigm, the confederate switched between a first round (5 trials) in which they systematically picked the opposite hand from the one named by the child ("left" vs. "right") to a second round in which they picked the child's indicated location (like in the classic version) and then the third round of picking the opposite location. This required children to alternate between telling truths, then lies, then again truths in order to successfully mislead the opponent, this alternation being the hallmark of second-order deception. Using this modified paradigm, Sai, Ding, et al. (2018) showed that children as young as 4 years old could tell second-order lies. However, in terms of individual differences, their deceptive behavior was only related to second-order ignorance (i.e., the knowledge that the opponent does not know whether the deceiver is telling a lie), a prerequisite of second-order ToM, and not to cognitive flexibility or second-order false-belief understanding.

Besides the pioneering work by Sai, Ding et al. (2018) with preschoolers, little is known about how older children perform when presented with the opportunity to use both truths and lies to mislead a suspicious target. Looking at school-age children's second-order lies, Leng et al. (2019) explored the neural mechanisms of second-order deception in 12-to-14-year-old children. Their findings suggest that deceptive intentions, rather than simply making counterfactual statements, increased the demand for cognitive control in second-order liars. However, less is known about how processes such as theory of mind and executive functions may support second-order lie-telling behavior in school-age children.

Given their enhanced socio-cognitive development (especially executive functions and theory of mind), we would expect older children to be more inclined to tell second-order lies. For example, previous studies showed that children's inhibitory control drastically improves from preschool ages onward, with the greatest improvement being found between 7–12 years (Huizinga et al., 2006; Nelson et al., 2022). More so, Brocki and Bohlin (2004) discovered almost an identical developmental trend for working memory. Lastly, older children were also more advanced in their second-order false belief reasoning – an essential element of second-order deception (Sai et al., 2021). However, other papers indicate that children are more inclined to be truthful and less inclined to deceive after age 8 (Buta, 2020; Carl & Bussey, 2019; 2022). Is this because they tend to be more honest or better equipped with more advanced strategic deception skills? In this way, they might appear to be telling the truth while actually alternating between lies and truth to deceive. Due to the current limited understanding of children's ability to tell truths to deceive, past literature could not distinguish between these possibilities. The current study can provide a more comprehensive picture of children's lie-telling developmental trajectory by investigating the alternation between truths and lies as a deceptive strategy, thus accounting for the mixed findings regarding children's propensity to deceive during middle childhood.

Previous literature found that ***executive functions (EF)*** are strongly related to children's first-order deception (Alloway et al., 2015; O'Connor et al., 2020; Sai et al., 2021). Second-order lie-telling could be related to EF, such as inhibitory control, working memory, or shifting, given that children have to juggle with both truthful and untruthful information and to keep in mind what the opponent chose before in order to successfully deceive the recipient (Walczyk & Fargerson, 2019). Although a direct correlation between working memory and second-order deception was not investigated before, it is plausible that it plays a critical role in children's ability to deliver these types of lies conceptually. When deciding to engage in second-order deception, children must juggle multiple pieces of information (e.g., the truth value of their statements and the recipient's mental state) and flexibly adapt to the recipient's actions. Therefore, incorporating a measure of working memory could illustrate the predictive role of this ability for the more sophisticated form of deception involved in children's second-order lies.

Miller (2009) posited that “A lie is not dependent on the speaker’s representation of the listener’s specific belief; all that is necessary is that the speaker believes the listener is ignorant.”. As such, theory of mind prerequisites such as **first- and second-order ignorance** could also assist children in telling second-order lies. First-order ignorance represents a rudimentary form of mental state understanding, referring to children’s ability to grasp others’ lack of knowledge about a fact (e.g., others do not know an object’s location). In contrast, second-order ignorance allows for a higher-order epistemic structure, helping children understand one’s knowledge about the other’s lack of knowledge about something (e.g., children know that others do not know the truthfulness of their statements; Leduc et al., 2017). To be second-order liars, children must understand that their opponent is aware of their deceptive intention and that the recipient might not always follow their suggestions regarding the object’s location. They should also know that their opponents are unaware of whether they are telling the truth and, therefore, can use both truths and lies (pointing to the true or false location). However, further research is needed to elucidate the involvement of both ignorance and EFs in children’s second-order deception throughout development.

3.2.1.3. The Current Study

The current study aimed to innovatively investigate children’s elementary second-order lying behavior during middle childhood, relating it to their first- and second-order ignorance and EF (inhibitory control, shifting, and verbal working memory), using a modified hide-and-seek paradigm. We extend the seminal behavioral study by Sai, Ding, et al. (2018), which investigated second-order lying in young children, by 1) adding a crucial modification to the task design allowing for more trials and multiple alternations (between truths and lies) in the deceptive strategies employed; 2) expanding the age range to middle childhood (compared to 4-6 years in

Sai, Ding, et al., 2018); 3) including more EF measures (working memory added besides the inhibition and cognitive flexibility measured in the previous study).

Our investigation firstly addresses *a developmental question* since little is known about how second-order deception changes across development besides its emergence point. Sai, Ding, et al. (2018) showed that 5- and 6-year-olds were more likely to tell second-order lies than 4-year-olds. We aimed to extend the age range and verify whether the early documented age-related progress trend is maintained throughout middle childhood. An alternative possibility is that school-age children are less likely to tell second-order lies because the endorsement of moral standards increases, and self-serving lie-telling tendency decreases as children age (Carl & Bussey, 2019; Evans & Lee, 2011; Talwar et al., 2017). Lying is also frowned upon more by older children, with recent literature showing an inverted U-shape trend in the frequency of self-reported lying across development (Buta et al., 2020). Moreover, this relation is likely underpinned by children's increasing self-regulatory skills, enabling them to engage their moral standards more effectively and behave accordingly (Bussey, 1992).

Secondly, looking at the question of *individual differences*, based on the limited previous research regarding the socio-cognitive factors associated with second-order deception (Sai, Ding, et al., 2018; Leng et al., 2019), we wanted to check if exposing older children to a modified second-order deception paradigm, along with new measures of executive functions would complement the preliminary findings in the literature. As such, we anticipated that second-order lie-telling would be positively associated with first- and second-order ignorance (Sai, Ding, et al., 2018). Concerning executive functions, even if previous research did not indicate a significant relation between second-order lying behavior, inhibitory control, and cognitive flexibility in preschool children, these relations could be visible in older children. Indirect evidence from research exploring first-order lie-telling shows that inhibitory control, cognitive flexibility, and working memory are significantly related to school-age children's deception (Alloway et al., 2015; Evans & Lee, 2011). Based on this growing body of evidence indicating a stronger connection between lying and socio-cognitive development measures for older children, we also expected a positive relationship between children's ability to tell second-order lies and their inhibitory control, shifting, and verbal working memory, considering it is more cognitively demanding (especially in terms of mentalizing processes) than first-order deception (Zheltyakova et al., 2020, 2022).

To better evaluate children's ability to alternate between telling the truth and telling a lie to deceive, the hide-and-seek task involved three rounds requiring children to tell the truth to deceive and another two rounds requiring them to lie in order to deceive, which were alternated (e.g., truth, lie, truth, lie, truth). To control for the order effect imposed by the rounds that followed the random round, we had two experimental groups: one which was asked to tell the truth, and another one which had to tell lies after the random round. Based on previous literature demonstrating the presence of the habituation effect when telling truths and lies depending on their frequency (Verschuere et al., 2011; Visu-Petra et al., 2014), we anticipated that children's ability to tell the truth in order to deceive would surpass their lie-telling ability, considering the higher frequency to which they had to use truths vs. lies to deceive the experimenter in the task that assessed second-order lying. To our knowledge, it is the first time in the literature that the habituation effect is investigated in relation to second-order lie-telling.

Finally, to investigate children's understanding of the experimenter's *intent* to follow their guidance or not, we introduced a manipulation check. The hide-and-seek paradigm was modified to include a random round in which the child had no systematic rule to follow (i.e., the experimenter's choices appeared random) in order to devise an optimal response strategy. This was done to enhance the ecological validity of the paradigm and make it more similar to real contexts in which people can alternate between being skeptical or trustful when interpreting others' behaviors (Forgas & East, 2008), which creates a need for flexible adjustment of deceptive/truthful behavior. We predicted that children's response accuracy would be lower in the rounds that followed the random round of the game compared to the first three rounds because the participants needed to readjust and rediscover the best deceptive strategies after going through the experience of random choices made by the opponent.

3.2.2. Method

3.2.2.1. Participants

An a priori power analysis for a medium effects size of 0.5 showed that we needed 100 participants to gain the appropriate statistical power (0.8). Participants were recruited from two schools in Northwestern Romania based on existing collaboration protocols and the schools' availability. Consequently, we approached multiple classes from the 3rd and the 4th grades. Since we obtained written parental consent for 101 8- to 10- year -old children, we considered it an adequate sample size. The sample included 52 8-9 years-olds (28 females and 24 males; M_{age} in months = 111.43, SD = 6.19) and 49 10-years-olds (21 females and 28 males; M_{age} in months = 126.9, SD = 5.12). 66% of the participants came from middle-income Romanian families, according to the sociodemographic information they provided. The children gave verbal consent prior to their participation. The research project was approved by the local Institutional Review Board.

3.2.2.2. Procedure

Written parental consent was obtained prior to the children's participation in the individual testing sessions. The testing sessions took place in children's schools with the teachers' permission. Participants were tested in a quiet room where the second-order deception game was administered first. First- and second-order ignorance stories were administered next, followed by the verbal working memory task and the inhibitory control and shifting task. The sessions took approximately 25 minutes for each participant. At the end of the sessions, all the participants underwent a short debriefing and received the surprise reward promised in the deceptive game scenario.

3.2.2.3. Measures

Elementary Second-Order Lying Behavior

In order to evaluate school-age children’s elementary second-order lying behavior, we used an adapted version of the hide-and-seek task employed by Sai, Ding, et al. (2018). Children were instructed to hide a coin in one of their hands, while a confederate would try to guess the location of the coin during multiple trials. To create a highly competitive context, the confederate told the child that if they each time they did not find the coin the child would win a point. However, if the confederate did find the coin, the confederate would win the respective point. At the end of the game, if participants accumulated enough points, they could win a surprise reward. They were also told they had to win 4 points each round to win the reward. To make sure that the participants understood the rules, two practice trials of reversed roles were employed where the confederate was hiding the coin, and the participants were asking about its whereabouts.

The task encompassed 6 rounds with a maximum of 7 trials each (42 trials in total). Throughout the 6 rounds, we implemented a stopping rule in order to prevent participants’ fatigue and task monotony. If children won half-plus-one trials from the total number of trials in each round (i.e., 4 points out of a maximum of 7), the confederate proceeded to the next round. To capture the true variability in children's performance, we allowed them to obtain those 4 points consecutively or intermittently (if they lost some points in between), so children were allowed a maximum of 7 trials in order to gain the 4 points needed in each round for the surprise reward (see Figure 1 for a representation of the procedure).

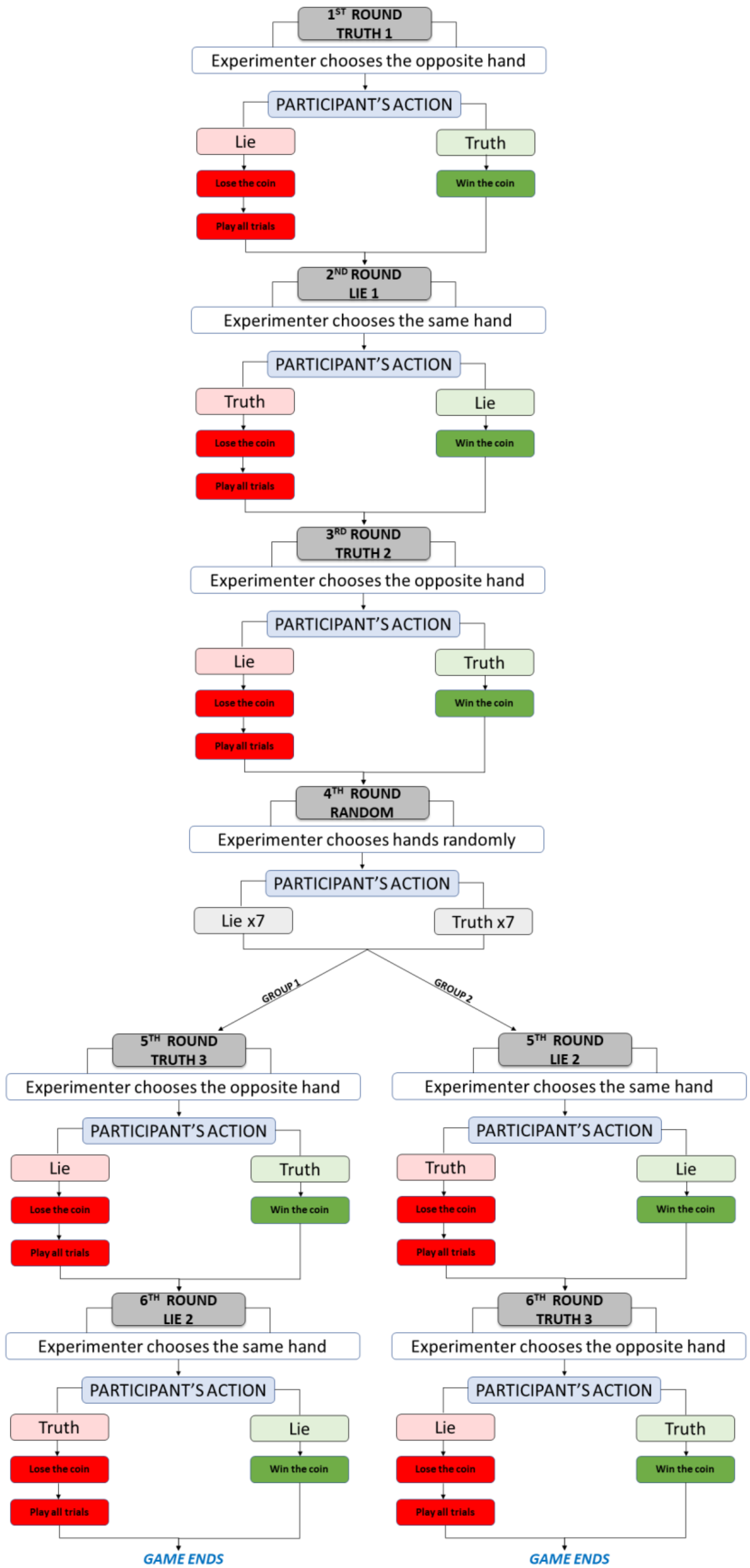
During the *first round* of the game (*Truth 1*), the confederate always chose the hand that was *not* indicated by the child. As such, in order to mislead the experimenter and win points, children had to communicate the true location of the coin by verbally indicating if they hid it in their "left" or "right" hands. Whenever the child won 4 points by telling the truth to deceive (or after the maximum 7 trials per round), the confederate proceeded to the second round. In the *second round* (*Lie 1*), the confederate changed the strategy and chose the same hand as indicated by the child. By eliciting children's lie-telling to deceive, the task now required them to switch between two deceptive strategies with the constant intention to mislead the opponent. Once again, whenever the child won 4 points by telling a lie to deceive (or after the maximum 7 trials per round), the confederate proceeded to the third round. The *third round* (*Truth 2*) was identical to the first one.

Because our study included a wide age range of children, we extended the task by adding more rounds to increase the complexity of the task for older children. In the *fourth round* (*Random*), the confederate chose in a predetermined random order (i.e., the order was the same for every participant), irrespective of what they indicated as the location of the coin (e.g., left hand, right hand, right hand, left hand, etc.). This round was meant to reset the deceptive strategies employed by children before, serving as a control round to ensure children's deceptive responses were not the result of entering a "do the opposite" response mode.

The first four rounds were identical for all participants. However, the order of the last two rounds differed depending on the deceptive strategy children had to employ after the random round. More specifically, for Group 1 (*n* = 51; M_{age} in months = 118.07; *SD* = 9.68; 23 females) in the *fifth round* (*Truth 3.1*) of the task, children needed to tell the truth to deceive the recipient (the confederate chose <u>the opposite hand again</u>). In contrast, in the *sixth round (Lie 2.1)*, they needed to lie about the location of the coin in order to win points (the confederate chose <u>the same hand</u> as the one indicated by the child). With regard to Group 2, (*n* = 50; M_{age} in months = 119.82; *SD* = 9.56; 26 girls), after the random round of the task (the *fourth round*), the order was reversed compared to Group 1's fifth and sixth rounds. More specifically, participants first had to use lie-telling to deceive successfully (*Lie 2.2)*, whereas, in the final round, they had to tell the truth to mislead the opponent (*Truth 3.2*). The two experimental groups were meant to control for the order of the rounds that came after the random round and to verify whether the order of the deceptive strategies employed could impact children's performance (see Figure 1).

Figure 3.2.1.

The Experimental Procedure for the Elementary Second-Order Lying Behavior for the Two Groups (Group1 – Truth after Random round; Group 2- Lie after Random round) with a Maximum of 7 Trials in Each Round


1ST ROUND
TRUTH 1
Experimenter chooses the opposite hand
PARTICIPANT'S ACTION
Lie
Lose the coin
Play all trials
Truth
Win the coin
2ND ROUND
LIE 1
Experimenter chooses the same hand
PARTICIPANT'S ACTION
Truth
Lose the coin
Play all trials
Lie
Win the coin
3RD ROUND
TRUTH 2
Experimenter chooses the opposite hand
PARTICIPANT'S ACTION
Lie
Lose the coin
Play all trials
Truth
Win the coin
4TH ROUND
RANDOM
Experimenter chooses hands randomly
PARTICIPANT'S ACTION
Lie x7
Truth x7
GROUP 1
GROUP 2
5TH ROUND
TRUTH 3
Experimenter chooses the opposite hand
PARTICIPANT'S ACTION
Lie
Lose the coin
Play all trials
Truth
Win the coin
6TH ROUND
LIE 2
Experimenter chooses the same hand
PARTICIPANT'S ACTION
Truth
Lose the coin
Play all trials
Lie
Win the coin
GAME ENDS
5TH ROUND
LIE 2
Experimenter chooses the same hand
PARTICIPANT'S ACTION
Truth
Lose the coin
Play all trials
Lie
Win the coin
6TH ROUND
TRUTH 3
Experimenter chooses the opposite hand
PARTICIPANT'S ACTION
Lie
Lose the coin
Play all trials
Truth
Win the coin
GAME ENDS

At the end of the task, similar to the procedure of Sai, Ding, et al. (2018), children were asked why they sometimes chose to tell the truth about the coin's location. This was to explore children's understanding of telling the truth to deceive. All the deceptive participants admitted that they told the truth to fool or mislead the confederate. Children who succeeded in employing the right deceptive strategy (truth-telling or lie-telling to deceive) at least 4 times in each round were coded as second-order liars (scored as 1), while the others were truth-tellers (scored as 0). Moreover, children's second-order lying accuracy (the mean percentage of successful truth-telling and lie-telling trials from the total number of trials completed by each participant) was also computed and used as a continuous dependent variable.

First- and Second-Order Ignorance

Two vignettes adapted from White et al. (2009) were used to evaluate children's first- and second-order ignorance. For each story, children were asked two control questions to ensure they understood what happened in each story and two questions to assess the two forms of ignorance. For example, one of the stories involved Sammi, a boy who accidentally broke one of the school's windows with a soccer ball while trying to prevent a little girl from being hit by the ball. The teacher arrived when Sammi broke the window punishing him for his wrongdoing. For this story, children were asked if the teacher was aware of why Sammi hit the window (the first-order ignorance question measuring one's knowledge about the other's intent) and why Sammi thought the teacher would want to punish him (the second-order ignorance question).

For the first-order ignorance score, children received 1 point for a correct response to the question in each story, thus having a minimum final score of 0 and a maximum final score of 2. For the second-order ignorance score, children received 1 point for a correct response to the question in each story, with a minimum final score of 0 and a maximum final score of 2.

Inhibitory Control and Shifting Ability

The Inhibition and Shifting task from NEPSY II (Developmental Neuropsychological Assessment II; Korkman et al., 2007) assessed children's ability to cognitively inhibit an automatic response and flexibly switch between different mental sets. In the Naming trial, children had to name a series of black-and-white squares and circles as fast as possible. For the Inhibition trial, the children were shown the same display as before, being asked to provide the name of the opposite shape (i.e., to say ‘circle’ when seeing a square and ‘square’ for a circle). The same display was also used in the Shifting trial. However, in this final trial, children were instructed to correctly name the black shapes and provide the opposite name if they were white (i.e., to say 'square' if they saw a black square and to say 'circle' if they saw a white square).

In a second display containing Arrows, the entire Naming, Inhibition, and Shifting process was repeated, only that this time we used upward and downward pointing arrows. The completion time for each test trial was recorded. The corrected (if the child makes an error but immediately corrects it) and uncorrected (if the child makes an error and does not correct it) errors were also recorded. Based on these, we computed efficiency index scores for inhibition and shifting, representing the completion time divided by accuracy (i.e., the maximum score minus the total number of errors for each type of trial).

Verbal Working Memory

In order to assess children's verbal working memory, the Backward Digit Span task (Wechsler, 2003) was used. Children were asked to repeat six series of 3, 4, 5, 6, and 7 digits that the experimenter read in reverse order. The children received one point for each correct series, and the sum of all points represented their final score.

3.2.3. Results

3.2.3.1. Descriptive Analysis of Children's Elementary Second-Order Lying Behavior

Approximately 71% of children (72 of 101) told elementary second-order lies, based on the cut-off point of 4 successful trials. For those classified as second-order liars, the mean number of trials taken to tell second-order lies was 20 (SD = 0.11) out of a maximum of 35 (*Truth 1; Lie 1*, *Truth 2; Lie 2*, *Truth 3*). Descriptive statistics for the two experimental groups can be found in Table 3.2.1.

A preliminary analysis revealed no significant differences between the two experimental groups in overall second-order lying accuracy or other socio-cognitive measurements. For example, we compared Group 1 participants' response accuracy from Round 5 (*Truth 3.1*) of the hide-and-seek game with Group 2 participants' response accuracy from Round 6 (*Truth 3.2*). Results showed non-significant differences, $t(49) = 0.859$, $p = .395$. The same was for all the cognitive tasks used (e.g., second-order ignorance, $t(99) = -0.59$, $p = .555$; first-order ignorance, $t(99) = 0.92$, $p = .358$; inhibition, $t(99) = -0.33$, $p = .742$; shifting, $t(99) = 1.58$, $p = .116$; verbal working memory, $t(99) = 0.47$, $p = .638$). Consequently, we computed new response accuracy scores by matching their scores from Round 5 and Round 6 accordingly (e.g., we merged Round 5 for Group 1 with Round 6 for Group 2). All subsequent analyses treated them as a single group. Also, to test for the multicollinearity in our data set, bivariate correlations were computed. Based on the obtained values, the assumption of collinearity assumption was not violated (see Table A 1.).

Table 3.2.1.

Descriptive Statistics for the Socio-Cognitive Measurements and Second-Order Lie-Telling Accuracy

	Group 1		Group 2	
	M	SD	M	SD
Inhibitory Control	2.32	0.79	2.39	1.32
Shifting	3.55	1.15	3.15	1.35
Verbal Working Memory	12.94	3.15	12.62	3.67
Second-Order Ignorance	1.68	0.46	1.74	0.44
First-Order Ignorance	1.90	0.30	1.84	0.37
Lie-telling Accuracy (%)				
Round 1 (Truth 1)	79.43	17.68	72.80	16.24
Round 2 (Lie 1)	52.10	28.13	48.76	24.71
Round 3 (Truth 2)	71.47	22.96	72.34	18.09
Rounds 1-3	63.57	10.92	61.48	9.20
Round 4 (Random Round)	41.73	23.53	43.14	19.6
Round 5 (Lie 2.1/Truth 3.1)	50.60	28.75	59.50	27.01
Round 6 (Truth 3.2/Lie 2.2)	71.67	21.34	67.44	23.60
Rounds 5-6	57.70	15.84	60.72	16.60
Overall accuracy across all rounds	60.80	11.74	60.80	10.44

3.2.3.2. Relations of Age and Socio-Cognitive Measures to Children's Elementary Second-Order Lying Behavior

To examine the relations between the ability to tell elementary second-order lies and its socio-cognitive correlates, a *binomial logistic regression* was conducted with children's elementary second-order lie-telling ability (1 = having the ability to tell second-order lies; 0 = not having the ability to tell second-order lies) as the predicted variable. Demographical variables, such as age in years, income, and parental education, were entered in the first step. We decided to control for these demographical variables given previous research demonstrating a positive relationship between income/maternal education and Romanian school-age children's first-order deception propensity (Prodan et al., 2022). Ignorance measurements (first- and second-order ignorance) were entered in the second step of the regression. Lastly, EF measurements (inhibitory control, shifting, and verbal working memory) were added in the third step. The first model was not significant $\chi^2(4) = 6.101$, Nagelkerke $R^2 = .08$, $p = .192$. However, when looking at the predictors entered in this step, children's age was a significant negative predictor of their ability to tell second-order lies (β = -0.10, Wald = 4.19, $p = .040$, OR = 0.49). The second step of the model involving ignorance measurements was significant, $\chi^2(2) = 48.527$, Nagelkerke $R^2 = .59$, $p = .000$. When examining which specific scores significantly contributed above and beyond all other common contributions in the model, the second-order ignorance score was significant (β = 0.33, Wald = 27.57, $p = .000$, OR = 41.57), whereas first-order ignorance was not significant (β = 0.04, Wald = 0.394, $p = .530$, OR = 1.88). The results indicated that children were significantly more likely to tell second-order lies with better performance in second-order ignorance. The last step of the model was also significant, $\chi^2(3) = 34.367$, Nagelkerke $R^2 = .83$, $p = .000$. From the EF measurements, verbal working memory was the only significant predictor of children's second-order lie-telling ability (β = 0.74, Wald = 10.03, p = .002, OR = 3.72), showing a positive relation with children's second-order lie-telling ability. Neither the inhibitory control index (β = -0.14, Wald = 0.48, p = .480, OR = 0.51), nor the shifting ability index (β = 0.10, Wald = 0.37, p = .540, OR = 1.51) were significant above and beyond the common contribution of the other measures included in the analysis. Moreover, the effect of age was also significant (β = -0.37, Wald = 6.33, p = .012, OR = 0.08).

The second-order ignorance and EFs effects on second-order lying behavior were also replicated through another *hierarchical regression* using children's overall response accuracy as a continuous measure of their elementary second-order lie-telling ability (see Table 3.2.2).

Table 3.2.2.

Hierarchical Regression Results for the Socio-Cognitive Predictors of Children's Elementary Second-Order Lie-Telling Accuracy

Variable	B	95% CI for B		SE B	β	R^2	ΔR^2
		LL	UL				
Step 1						.04	.04
Constant	86.54***	58.20	114.88	14.27			
Age	-2.98*	-5.94	-0.01	1.49	-.20*		
Maternal Education	0.39	-1.28	2.08	0.85	.07		
Paternal Education	-0.60	-2.43	1.21	0.91	-.11		
Income	0.82	-1.28	2.92	1.06	.09		
Step 2						.40	.36***
Constant	49.98***	24.66	75.30	12.75			
Age	-1.92	-4.30	0.45	1.19	-.13		
Maternal Education	0.09	-1.25	1.44	0.68	.01		
Paternal Education	-0.68	-2.15	0.77	0.73	-.12		
Income	0.28	-1.40	1.97	0.85	.03		
First-order ignorance	3.84	-1.97	9.66	2.93	.11		

Second-order ignorance	13.58***	9.33	17.82	2.13	.55***		
Step 3						.50	.09***
Constant	44.34**	15.38	73.30	14.58			
Age	-1.86	-4.29	0.56	1.22	-.12		
Maternal Education	-0.04	-1.29	1.21	0.63	-.00		
Paternal Education	-0.65	-2.01	0.71	0.68	-.12		
Income	-0.14	-1.73	1.44	0.80	-.01		
First-order ignorance	2.56	-2.89	8.01	2.74	.07		
Second-order ignorance	10.25***	5.91	14.60	2.18	.42***		
Inhibitory control	-0.73	-2.45	0.99	0.86	-.07		
Shifting	0.91	-0.54	2.38	0.73	.10		
Verbal working memory	1.08***	0.52	1.64	0.28	.33***		

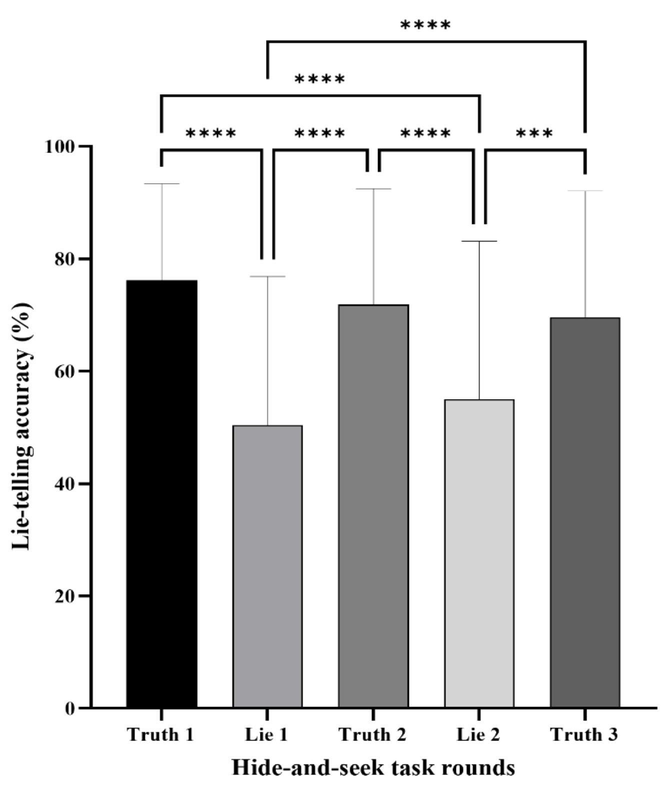
Note: *p<.05; **p<.01; ***p<.001

3.2.3.3. The Habituation Effect and Manipulation Check in Elementary Second-Order Deception

We tested the difference between children’s accuracy when using truths to deceive vs. when using lies to deceive by employing a paired-sample *t*-test. Results revealed a significant difference in children’s accuracy when telling the truth vs. when telling a lie, $t(100) = 5.40$, $p = .000$. The accuracy of telling the truth to deceive (M = 70.59) was higher than the lie-telling accuracy (M = 51.88), which supports the habituation effect.

To further test the presence of the habituation effect in second-order deception, a repeated measures ANOVA was performed, using the truth-telling and lying accuracy from each round (except for the random round). Results showed a significant difference in children’s accuracy between rounds, $F(2.12, 212.10) = 22.32$, $p < .001$, partial $\eta^2 = .18$. Pairwise comparisons using the Bonferroni correction revealed specific differences in children's accuracy when telling truths vs. lies to deceive the confederate. For instance, significant differences were obtained between *Truth 1* (*M* = 76.15, *SD* = 17.22) and *Lie 1* (*M* = 50.44; *SD* = 26.41), and between *Truth 1* and *Lie 2* (*M* = 55.01; *SD* = 28.12), with a better lying accuracy being found for *Truth 1* in both cases. Another important significant difference was between *Lie 2* and *Truth 3* (*M* = 69.58, *SD* = 22.48), with children's accuracy being higher for *Truth 3* than for *Lie 2*. However, no differences were found between *Truth 1*, *2*, and *3*, nor between *Lie 1* and *Lie 2* (see Figure 3.2.2 for all the significant differences obtained).

Figure 3.2.2.
Children's Truth-Telling and Lie-Telling Accuracy Across the Hide-and-Seek Game's Rounds



p* < .01; *** *p* < .001; * *p* < .0001

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Lastly, to check the effect of our manipulation in the hide-and-seek game, another paired-sample *t*-test was employed. Results revealed a significant difference in children's response accuracy between the first three rounds of the task (the ones completed before the random round) and the last two rounds (the ones completed after the random round), $t(100) = 2.47$, $p = .015$. Second-order lying accuracy before the random round ($M = 62.53$) was higher than after the random round ($M = 59.19$), thus confirming the effects of the random round on children's task performance.

3.2.4. Discussion

The current investigation was the first to address the interplay between children's ability to tell elementary second-order lies and their socio-cognitive development during middle childhood. First, with regard to our developmental question, results revealed a negative association between age and children's propensity to tell second-order lies. Second, children's elementary second-order lie-telling ability was positively related to second-order false belief understanding and verbal working memory. Lastly, we found that telling the truth to deceive first was costly for children's subsequent lie-telling accuracy in the hide-and-seek paradigm. Additionally, we provided preliminary evidence that children's second-order lie-telling was based on their understanding of the experimenter's intent and their flexibility in adjusting their deceptive strategy to contextual cues offered by the opponent.

3.2.4.1. Age and Second-Order Deception

Addressing the *developmental question*, we showed that children between 8 and 10 years were proficient in alternating between truths and lies to deceive for personal gain, with approximately 71% of the participants being qualified as second-order liars. However, there was a surprising negative association between children's second-order lie-telling and age, with older children being less likely to engage in this behavior. This finding is, however, consistent with previous research demonstrating a decrease in children's propensity to lie for self-serving purposes after the age of 8 (Carl & Bussey, 2019; 2022; Lavoie et al., 2017; Talwar & Lee, 2002, 2008). As other authors contend, one possible explanation for this age-related decrease may derive from children developing more robust moral standards emphasizing the wrongness of lying for personal gain (Evans & Lee, 2011). In the case of second-order lie-telling, with increasing age, children become more capable of carefully analyzing the costs and benefits involved in telling a lie (Walczyk & Fargerson, 2019) and decide that it is morally reprehensible to flexibly adjust their behaviors to mislead ("manipulative truths"; Zheltyakova et al., 2022).

3.2.4.2. Socio-Cognitive Correlates of Elementary Second-Order Deception

Looking at *individual differences* in second-order deception, children’s first- and second-order ignorance and executive functions (inhibitory control, shifting, and verbal working memory) were examined. Results showed that children’s second-order ignorance was positively associated with their likelihood to deceive by flexibly telling truths and lies. When telling an elementary second-order lie, a child needs to recognize that their opponent is aware of the child’s intention to deceive and, therefore, would not always look for the coin in the location indicated by the child. Moreover, the deceiver needs to be aware that the opponent does not know whether the child is currently lying or not. The current findings confirmed the hypothesis by Miller (2009) that a lie is dependent on the speaker’s belief that the listener is ignorant, which supports previous research on the relation between second-order deception and second-order ignorance in preschool children (Sai, Ding, et al., 2018). Unlike other paradigms (e.g., the temptation resistance paradigm), here the deceiver does not rely on false believe understanding, but could rely solely on second-order ignorance (i.e., the knowledge that the recipient does not know whether the deceiver is telling a lie) to alternate between truths and lies.

Alternatively, in a leaner interpretation, children's ability to tell elementary second-order lies in this paradigm could rely on a simple and flexible adjustment to the opponent's behavior via repetitive learning of the successful strategy across trials. Even though this flexible adjustment to the opponent's actions is a defining feature of elementary second-order deception, we argue that it is insufficient for children to discover how to deceive a suspicious target. At least an initial understanding of others' ignorance is necessary for children to understand that they can use true and false information to deceive the opponent and win. This understanding was induced by the game's instructions, where children were explicitly required to prevent the confederate from finding the coin. Thus, participants were prompted to consider the opponent's level of knowledge and devise the most suitable strategies based on it. Moreover, answers to our post-hoc question showed that approximately 80% of the participants admitted to having a deceptive purpose based on the confederate's ignorance (e.g., "I knew you would not believe me and that I could do that [telling the truth] to trick you so you would not find the coin" – a 10 years old participant). However, we identified a group of children who constantly used truth-telling as a strategy across all the trials in the hide-and-seek game (*n* = 15), similar to the "no cheating" cluster in previous studies with the hide-and-seek paradigm (Ding, Heyman, Fu, et al., 2018; Seucan et al., 2022). Descriptive post-hoc analyses (see Supplementary materials) showed that their performance on almost all the cognitive measures included (first- and -second-order ignorance, verbal working memory, and inhibitory control) was lower than that of the other children who tried to alternate between truths and lies throughout the game. The correlation between socio-cognitive proficiency and second-order deceit would not be justified if the game simply relied on a repetitive response set. After initially discovering the appropriate deceptive strategy, it is possible that children no longer needed to consider the opponent's beliefs to accomplish their deceptive purpose. Instead, they relied on their ability to adjust to the other's actions via response suppression and choosing the alternative response set. Further research is required to elucidate the differential dynamics of second-order ignorance understanding and flexible adjustment of responses throughout various second-order deception-eliciting paradigms.

Our findings also showed a non-significant relation between first-order ignorance attribution and second-order deception. Such findings might be surprising given that past research demonstrated that first-order ignorance (or its correlate, knowledge access) predicted preschoolers' first-order deception (Leduc et al., 2017; Ma et al., 2015). However, to tell second-order lies, first-order ignorance attribution (e.g., understanding that the opponent does not know the correct location) is not sufficient for children to realize that the opponent does not know if they are lying or not, which requires more advanced reasoning abilities. A more basic explanation would be to look at the reduced variation in children's first-order ignorance performance. Our data showed that 87% of children obtained the maximum score on the first-order ignorance questions, while only 13% of them had a partial score. This ceiling effect minimizes the chances to obtain a significant relation with second-order deception.

Consistent with our hypothesis, we also found a positive association between children's ability to tell elementary second-order lies and their *verbal working memory performance*. To tell second-order lies, children had to constantly remember (across the minimum four trials required to be considered second-order deceivers) what hand the opponent chose in the last trial, what hand they had indicated in the respective trial, and what the opponent chose over and over to select the best deceptive strategy. Our results are in line with previous empirical evidence showing a positive association between children's verbal working memory and their ability to sustain their lie-telling behavior (Alloway et al., 2015). As a possible explanation relating children's cognitive competence to their lie-telling proficiency, the capacity-based perspective (Keenan et al., 1998) suggests that increasing working memory capacity provides children with the mental "space" to communicate social concepts that could not be expressed due to limited mental resources.

However, we found no significant relations between children's ability to tell second-order lies and their *inhibitory control* or *shifting ability*. These null findings may be attributed to different inhibitory and switching demands imposed by the tasks we used. Previous research made a distinction between inhibitory tasks that impose a delay and those that involve an active conflict (Carlson & Moses, 2001). The hide-and-seek game that we developed imposed low executive demands within each round. After discovering the optimal deceptive strategy for the respective round, participants engaged in a simple task of response suppression to win points in that round, which demanded minimal inhibitory effort. Response suppression represents a subtype of inhibitory control that implies simply withholding a prepotent response in favor of another (Nigg, 2000), which could result in participants entering an "attentional inertia" state which would involve them simply pointing to the same/opposite hand than where the coin was hidden (Diamond, 2013). On the other hand, the individual differences inhibition task was designed to tap into attentional control rather than simple response suppression. Attention control involves inhibiting an internally represented response set that interferes with the ability to engage and implement a new response (Cheie et al., 2015; Diamond, 2013).

Similarly, in the hide-and-seek game, shifting was only employed when proceeding from one round to another (except during the random round). In contrast, the shifting NEPSY task required constant switching between responses from one stimulus to another. Finally, other studies suggested that the variance in inhibitory control can be significantly explained by individual differences in working memory capacity (Tiego et al., 2018). In predicting children's second-order lie-telling, we can suspect a similar overlap between children's inhibitory control and working memory processes. In the supplementary materials, we showed that if we introduced inhibitory control in a separate step from working memory in the binomial regression, the inhibition efficiency index became a significant predictor of second-order lie-telling.

3.2.4.3. The Habituation Effect and Manipulation Check in Elementary Second-Order Deception

We also aimed to assess whether children's accuracy in telling lies to deceive can be affected by repeatedly telling the truth to deceive. Our findings suggested that after repeatedly learning to tell the truth to mislead the opponent, children's accuracy in the subsequent rounds involving lie-telling was lower, which could point to a habituation effect. Previous literature on adults showed that participants' responses were slower and less accurate when lying was elicited after initially having told the truth (Visu-Petra et al., 2014). Our study shows that this could also be true for truths told to deceive in children. In their second-order lies, the intention to deceive remained constant, so children became habituated to a specific deceptive strategy (telling the truth), corresponding to the Construction and Action components of the ADCAT (Walczyk et al., 2014). In the Construction component analysis, Walczyk et al. (2005) suggest that responses to simple yes/no questions do not impose high processing costs, the elicited actions in our paradigm being very similar in complexity (repetitively naming one of their hands: left or right). Nevertheless, past research investigating children's ability to tell left from right demonstrated that this discrimination fully develops only after age 10 to 12 (Benton, 1959; Boone & Prescott, 1968), with 10-year-olds still making some errors. As such, the construction and implementation of these lies could still impose a significant cognitive load, despite their simple dichotomous nature.

In line with the habituation effect, our post-hoc findings based on the coefficient of variation (Bedeian & Mossholder, 2000) suggested that when using truths to deceive, children’s scores did not vary that much compared to when they were being asked to tell lies in order to deceive (see Table A2). Established as the dominant task-set, telling the truth to deceive could be easier for children to employ, thus having a steady accuracy within those trials. Instead, lie-telling was the weaker task-set required, so children’s accuracy when telling lies fluctuated more within those trials as they were still searching for the most suitable deceptive strategy. A possible explanation supporting these findings comes from past research demonstrating that a response can be habituated through more trials performed. For instance, in Verschuere et al. (2011) participants in the frequent-lie group were required to lie in 75% of the trials, whereas participants in the frequent-truth group only lied in 25% of the trials. Results showed that lying became easier while people were lying more often, whereas lying became more difficult when people gave more truthful responses (Hu et al., 2012; Van Bockstaele et al., 2012). In the second-order deception task of this investigation, 60% of the trials (except the random round) required children to tell the truth to deceive, whereas only 40% of the trials required them to tell a lie to deceive. This higher frequency of the true response could explain the documented habituation effect and the lower variance in children’s scores when telling the truth.

Lastly, we tested whether the manipulation check we introduced affected children’s performance in the hide-and-seek game. Results showed a better performance during the first three rounds than on the last two, which was consistent with our expectations. After the first three rounds, the opponent choices did not follow any systematic rule in Round 4, which baffled participants and made them question the other's belief or access to knowledge about their own intentions to deceive or knowledge about them telling truths and lies. As such, in the last two rounds of the game, their accuracy in telling truths and lies to deceive was lower, meaning that it took participants longer (in the number of trials) to successfully tell second-order lies because they needed to rediscover what deceptive strategy would optimally suit each new round. This can be interpreted as indirect evidence that children's understanding of a systematic intent to follow or not their lead can affect their strategic deployment of lies and truths in order to mislead.

3.2.4.4. Limitations

Despite these provocative findings, this study has some limitations worth mentioning. First, our second-order deception task started with a truth-telling trial, so we had three rounds requiring children to tell the truth and two rounds requiring them to lie in order to mislead the opponent. This could influence children's ability to alternate between truths and lies as they were first taught to tell the truth. Future research could extend this line of research by adding another condition of telling a lie first and then the truth in order to replicate the habituation effect. Moreover, this effect is also worth testing in adult samples telling second-order lies.

Another limitation is the current study's design, its cross-sectional nature making it impossible to test for causal relations between children's proficiency to tell second-order lies and their socio-cognitive development. Longitudinal research is needed in order to validate the involvement of ToM and EFs in the development of second-order deception in middle childhood.

Lastly, the influence of culture was not considered when expanding the behavioral study of Sai, Ding et al. (2018). This factor can significantly impact the relation between children's second-order deceptive abilities and socio-cognitive development (Lee & Imuta, 2021). Recent research on cross-cultural deception comparisons showed a difference between Chinese and

Northern American school-age children’s propensity to lie and their evaluations of lies. Lie-telling propensity was higher for Chinese children than Northern American children, whereas Chinese children evaluated lie-telling more negatively than Northern American children (Tong et al., 2023). This suggests that children could have different propensities of engaging in deceptive behavior cross-culturally. However, further cross-cultural studies are needed to explore how cultural practices impact children’s second-order deception.

3.2.4.5. Implications

The current investigation provides promising insights into children’s elementary second-order deception and its relation to ignorance and executive functions. School-age children can realize that, given the competitive context, they can use truths and lies to mislead a recipient aware of their deceptive intentions. Moreover, we demonstrated that in order to tell second-order lies, 8- to 10-years old children could make use of their second-order ignorance attributions and working memory. Thus, the current findings can have important implications for children’s moral development and moral education. Our results pinpoint that simply distinguishing between truthful and deceptive behavior might be insufficient to make an appropriate moral judgement (e.g., telling the truth is generally considered the socially acceptable behavioral strategy). Rather, children could learn to consider others’ intentions when judging their overt behavior, which would facilitate children’s moral understanding and judgment in the competitive games. For instance, in competitive games that children play (e.g., Saboteur, Among Us, Werewolves, Mafia), even if someone is telling the truth, it could be used with malicious intentions, so the truth becomes manipulative. As the current study found that second-order ignorance is related to children’s second-order deception, the results are consistent with the extensive studies about the importance of theory of mind in children’s moral development (D’Esterre et al., 2019). Future studies on moral education could explore ways to train children's different theory of mind understanding to improve their understanding of deceptive intention.

Lastly, we extended the understanding of second-order deception in children by providing preliminary findings on the habituation effect when telling second-order lies. To the best of our knowledge, this is the first study to address this construct in relation to second-order deception, proving that, similarly to first-order deception, it is not that much about what deceptive strategy it is easier to employ (telling the truth to deceive vs. telling a lie), but more about which one is the habitual type of response (Visu-Petra et al., 2014). This warrants further research into the complex network of second-deception influences.

3.2.4.6. Conclusion

In summary, the current study examined 8- to 10-year-old children's elementary second-order lying and its relation to socio-cognitive correlates. With increasing age, we found that children were less likely to tell second-order lies. Moreover, we found that second-order ignorance and verbal working memory positively predicted children's second-order lying propensity. The current results extend existing findings on children's ability to tell second-order lies and demonstrate that school-age children show higher strategic deception in a hide-and-seek game and that this ability is positively associated with their increasing recursive thinking (e.g., I know that you don't know I'm telling a lie) and their growing processing capacity. Moreover, we provide preliminary evidence on the habituation effect in telling second-order lies. Given that the ultimate goal remains constant – deceiving the opponent, children can become habituated to a specific deceptive strategy depending on which one is the most dominant. In the present study, children demonstrated a habituation tendency in their truth-telling to deceive, which could also be in line with the truth-default theory.

Study 3: Socio-cognitive correlates of primary school children's deceptive behavior toward peers in competitive settings

3.3.1. Introduction[10]

Children engage with peers early on, their relationships becoming increasingly important with age. During middle childhood and adolescence, children become more apprehensive of their need to establish and sustain cooperative social exchanges with peers (Steinhoff & Keller, 2020). Nevertheless, the major shift from child-parent relations to peer-to-peer relations begins in elementary school when children's social environment expands, and peer interactions impose new competing needs and motivations (Bosacki, 2021). From primary to secondary school, children are exposed to broader peer groups, allowing them to select peers with whom to establish friendships. Young children's friendships are characterized by proximity and sociodramatic play, whereas shared goals and more structured games are more common across elementary school years (Rose et al., 2022). Extensive research demonstrates that peer relationships are essential for psychological adjustment across the lifespan (Bosacki, 2016, 2021; Carpendale & Lewis, 2004). For instance, having few friends or low-quality friendships is related to internalizing symptoms such as depression or loneliness (Dykstra et al., 2020; Rose et al., 2022; Schwartz-Mette et al., 2020).

3.3.1.1. Children's Competitive Behavior

Irrespective of children's peer relationships, cooperating and competing with others is fundamental to socially adaptive behavior (Fülöp, 2022). Competing for scarce resources is typical in children from a very young age (e.g., competing for toys; Green & Rechis, 2006). The seminal

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study by Toda et al. (1978) showed that competitive behavior increases with age. In this study, children between 7-12 years were compared, showing that with increasing age, the more feedback they received about a competitor's performance, the more competitively they behaved. Moreover, children are sensitive to victory and loss in competitive games from early on (Underwood et al., 1999). They can discern whether they are better or worse than their opponent and identify their place in the social hierarchy based on their performance (Mascolo & Fischer, 1995).

In the literature, competition has been considered incompatible with positive peer relations (Fülöp, 2022; Verheijen et al., 2019). Nevertheless, a growing body of evidence demonstrates that competition does not always compromise friendships. For example, Fonzi et al. (1997) showed that 8-year-old friend dyads displayed a greater positive affect during competitive games than non-friend dyads. Also, in highly competitive settings, only boys tended to be more competitive toward friends than non-friends (Green & Rechis, 2006).

In order to strategically compete for resources, specific cognitive abilities are required. Competing with peers requires understanding others' behavior, intentions, and goals (theory of mind; ToM). Anticipating the interlocutor's actions and intentions while planning their own behavior based on those inferences is essential in competitive situations with peers (Benenson et al., 2001; Priewasser et al., 2013). Children may use their ToM proficiency for self-serving purposes, trying to manipulate others' beliefs strategically to outperform them in competitive contexts (Barlow et al., 2010; Bosacki, 2021; Roberts et al., 2020). In this respect, peer relations may provide children with the context for practicing dishonesty for self-serving purposes (Banerjee et al., 2011; Williams et al., 2016).

3.3.1.2. Children's Deceptive Behavior

Resorting to deception for self-serving purposes is expected early on, with preschoolers as young as 30 months being capable of denying wrongdoings to avert negative consequences (Evans & Lee, 2013; Leduc et al., 2017). Later, they become increasingly aware of others' mental states and the possibility of manipulating them by instilling false beliefs. With increased mentalizing abilities, children's deceptive endeavors become more and more sophisticated throughout childhood (Carl & Bussey, 2022; Evans & Lee, 2013; Talwar et al., 2007). Children's reliance on mental state understanding when lying was succinctly stated by Lee (2013) by defining deception as "theory of mind in action". A growing body of evidence supports this claim by showing that first- and second-order theory of mind understanding are related to children's deception (Evans & Lee, 2013; Talwar & Lee, 2008; Williams et al., 2017). In order to deceive a recipient, children need to understand the possibility of instilling a false belief into the opponent's mind and anticipate the recipient's behavior based on these false beliefs.

Other cognitive processes relevant to deception are executive functions (EFs), which coordinate goal-oriented behavior through inhibitory control, working memory, and cognitive flexibility (Zelazo et al., 2003). Theoretical and empirical accounts emphasize the dynamic role of EFs in children's lie-telling behavior. For instance, the Activation-Decision-Construction-Action Theory (ADCAT; Walczyk et al., 2014), which was further adapted to explain children's deception (Walczyk and Fargerson, 2019), posits that being dishonest imposes a greater cognitive load, referring to the executive processes entailed. The *Activation* component rests on truth solicitations from the social environment, for which children need to convey a specific message. In some motivational contexts, children are faced with a *Decision* about whether (and how) to deceive, requiring careful consideration of the expected values of truth-telling vs. lie-telling. With the decision to lie comes the *Construction* of those lies, which can be made through different strategies to ensure consistency (e.g., using pieces of truthful information). After mentally rehearsing the lies, the *Action* component entails their delivery. Executive functions constantly assist the cognitively demanding process of lie-telling. Working memory, for example, allows children to retrieve and process the necessary information swiftly. When deciding on the best response strategy (truths or lies), executive functions such as cognitive flexibility, working memory, and inhibitory control help children in their evaluations regarding the expected values of different responses by allowing a flexible alternation between possible scenarios and associated consequences while keeping all the relevant information activated and inhibiting inconsistent or unplausible responses. Next, to construct plausible lies, children may rely on some truths to devise the most credible lies, thus reducing the cognitive load of lying (the plausibility principle). To this end, inhibitory control and cognitive flexibility help them switch between truths and lies while inhibiting prepotent responses constantly (e.g., the whole truth). Lastly, to deliver the lies in the most convincing ways, working memory assists deceivers in remembering the admonition not to disclose the truth, while inhibition ensures the suppression of inconsistent verbal/non-verbal behaviors (Walczyk & Fargerson, 2019).

In line with this theoretical model, previous studies addressing children's deception suggested that children with better inhibitory control were more likely to conceal a transgression (Kabha & Berger, 2023; Talwar, Lavoie, et al., 2017; Williams et al., 2017). In addition, Alloway et al. (2015) demonstrated a positive relation between children's deceptive proficiency and their working memory. The same pattern of results was obtained with regard to school-age children's ability to maintain their lies, with those with better inhibitory control and working memory being more proficient in telling elaborate lies (Evans & Lee, 2011). Lastly, other findings suggest that cognitive flexibility positively predicted children’s deceptive strategies (Ding, Omrin, et al., 2014; Talwar, Crossman, et al., 2017), helping children to switch between multiple tasks, such as truthful and deceptive responses, more swiftly (Christ et al., 2009).

Most of these results on children's deception come from experimental research in which children were required to play a game with an adult confederate who was instructed to appear unaware of the child's intention to deceive (Chandler et al., 1989; Ding et al., 2022; Hala et al., 1991). As an example, the *hide-and-seek paradigm* was widely used to investigate children's strategic deception, asking children to hide an object (e.g., a candy or a sticker) under one of the two cups. In order to win the game, the child needed to lie about the object’s location by indicating the opposite location to an experimenter who blindly followed their indications.

Nevertheless, in ecological contexts, oftentimes, the interlocutor can suspect the others' deceptive intent. This can be especially true for highly competitive contexts, where people know that others may try to trick them into gaining various advantages (e.g., negotiations, poker games). Consequently, the individual would tell truths or lies while inferring that the opponent can anticipate their deceptive behavior. In adult samples, the ability to use truthful information to deceive a suspicious target was demonstrated to entail the same cognitive load as false statements (Carrión et al., 2010; Kireev et al., 2017). Furthermore, researchers argued that this ability is associated with a higher demand for socio-cognitive processes than simply resorting to false information because it requires greater anticipation of others’ mental states (Prodan & Visu-Petra, 2022; Voltz et al., 2015). In children, this deceptive strategy was tested using the seminal hide-and-seek paradigm in which the opponent was aware of the participant's deceptive intentions and alternated between following or not their indications regarding the location of a specific object (e.g., a coin; Prodan et al., 2024; Sai, Ding, et al., 2018). Results showed that children's ability to alternate between truths and lies to deceive the confederate was positively related to second-order ignorance and verbal working memory (Prodan et al., 2024; Sai, Ding, et al., 2018).

3.3.1.2.1. Deceptive Behavior Toward Peers

So far, few studies have examined children's deceptive propensity and proficiency outside of child-adult relationships, despite a growing body of evidence demonstrating the importance of peers for developing sincere interactions (Fink, 2021, p. 123). Peer relations differ from the adult-child relationship because they are chosen and egalitarian. With these changes, children develop different goals and needs that may in contradiction with the standard of honesty, resulting in deceptive behavior toward peers (Dykstra et al., 2020). Previous research showed that children recognize that honesty is essential to interpersonal relationships, including friendships (Betts et al., 2013; Dykstra et al., 2020). For example, Perkins and Turiel (2007) showed increasingly complex reasoning about lying to friends in 12–17-year-olds. Most children disapprove of lying to friends due to concerns about trust, but those who find lying more acceptable often do so to avoid conflicts, maintain friendships, or protect personal privacy. Similarly, more recent findings based on adolescents' evaluations indicated that 12- to 14-year-olds endorsed disclosure and being forthcoming towards peers and parents across various motivational settings (e.g., avoiding consequences or negative identity-related emotions, protecting others). Moreover, adolescents were more inclined to endorse being forthcoming toward friends than to parents (Lavoie & Crossman, 2022).

However, other evidence shows that evaluations of lies and actual lie-telling behavior are often uncorrelated, particularly in the case of self-serving deception (Evans & Lee, 2013; Talwar & Lee, 2002). Therefore, going beyond evaluations of lie-telling is important for understanding children's deception in peer relations. Dykstra et al. (2020) provided essential evidence on adolescents' self-reported lie-telling frequency to friends. Their findings suggest that poorer friendship quality positively predicted lie-telling over time. In turn, lie-telling was bidirectionally and positively associated with participants' depressive symptoms over time. Thus, it is reasonable to infer that peer relations can influence their mental health indirectly through their lie-telling. Nevertheless, less is known about this dynamic in the early stages of development (e.g., primary school-age years) when the importance of peer relationships emerges.

To the best of our knowledge, there is no evidence of children's deceptive behavior towards peers in experimental settings assessing their propensity and proficiency to mislead familiar or unfamiliar peers for personal gain. The growing body of evidence documenting children's deceptive behavior focused exclusively on the child-adult dyads, including unfamiliar (e.g., a confederate) or familiar (e.g., a parent) adults. For example, Williams et al. (2013) found that in both self- and others-oriented deceptive contexts, children between 6-7 years were more likely to lie to an unfamiliar adult (the experimenter) the to their parents. This sets the stage for our study by showing that the target's level of familiarity may influence children's propensity to deceive in various motivational contexts. While we recognize the importance of studying children's propensity to lie to adults for self- or other-oriented purposes, it is also important to explore to what extent children decide to deceive their peers. Previous literature found longitudinal links between friendship quality and lie-telling, which in turn was related to emotional problems in adolescent samples (Dykstra et al., 2020; Engles et al., 2006). Lie-telling could undermine the social trust leading to poorer relationships across development (Talwar & Crossman, 2011), which could also apply to friendships. Conversely, the quality of social relationships can impact children's well-being. Berndt (2002) argued that friendships' quality directly affects their social adjustment, while a growing body of evidence suggests that it also influences children's emotional development (see Hartup, 2022 and Schwartz-Mette et al., 2020 for a review). Due to the rapid relational changes emerging in elementary school (from parent-child relations to peer relations), investigating primary school-age children's deception toward peers could be indicative of their motivations to lie, informing others areas of research on possible indirect effects on children's overall development.

3.3.1.3. The Current Study

The current investigation focused on how primary school-age children's strategic deception is associated with socio-cognitive development, specifically theory of mind (first-and second-order false belief understanding) and executive functions (inhibitory control, cognitive flexibility, and visuospatial working memory). A second purpose of the present investigation was to explore children's deceptive behavior as a function of their peer opponents' familiarity (familiar vs. unfamiliar) and actions (trusting vs. not trusting) in a competitive game with different reward stimuli (liked vs. disliked). Unlike the classic hide-and-seek paradigm in which children played the game in dyads against an adult confederate, the present hide-and-seek paradigm involved two peer opponents at once who differed in their familiarity with the participants (a friend vs. an unknown peer) and in their actions in response to participants' indications, either following the child's indication in a trusting manner ("same") or not following them, showing a non-trusting attitude ("opposite"). We implemented this multi-player design because not all lies are told in private dyadic interactions. Instead, children may have to tell lies in the presence of others that may or may not be affected by the lie (e.g., a group of friends). Our design aligns with other investigations on adult samples introducing a third-party player in deceptive settings (e.g., Xiong et al., 2022). The third player was considered neutral because the children's dishonest behavior toward one opponent did not affect the other opponent's chances of winning.

In this innovative and more ecological context, we set out to test several hypotheses. First, we aimed to explore children's deceptive propensity as a function of the opponents' *familiarity*. Considering our competitive deceptive game, we could expect children to deceive the familiar opponent less than the unfamiliar one due to the violation of trust involved. This was based on previous literature indicating children's negative evaluations of lie-telling toward friends and their tendency to be more forthcoming to them and disclose more, even if this entailed personal costs (Lavoie & Talwar, 2022; Perkins & Turiel,2007). Moreover, Perskin & Turiel (2007) demonstrated that younger adolescents (e.g., 12-year-olds) were more likely to invoke the principle of mutuality in friendships when rejecting lie-telling towards friends than their older counterparts (e.g., 17-year-olds), emphasizing preadolescents' understanding of the importance of honesty in peer relationships.

Second, we addressed an individual differences question related to the *socio-cognitive factors* involved in children's deceptive behavior toward peers. Previous literature indicates a positive association between children's theory of mind and deceptive abilities (Lee & Imuta, 2021; Prodan et al., 2024; Sai, Ding, et al., 2018). Therefore, we expected ToM to be significantly related to children's performance in the hide-and-seek game, which involved truthful and deceptive pointing. Based on previous research indicating that telling the truth to deceive is more demanding in terms of mentalizing abilities than using false information (Zheltyakova et al., 2020), we hypothesized that children's willingness to tell the truth to deceive when the opponent's action was opposite to their indication is positively related to second-order false belief understanding. Instead, children's propensity to use false information to deceive when the opponent's action was the same could be positively related to first-order false belief understanding due to lower mental state understating requirements. Lastly, given the extensive research showing the link between children's deception and executive functions (see Sai et al., 2021, for a review), we also expected children's visuospatial working memory, inhibitory control, and cognitive flexibility to predict their performance during the hide-and-seek game. We chose to test children's visuospatial working memory based on the cognitive demands imposed by the hide-and-seek paradigm (e.g., to keep in mind the spatial location of the cards from the computerized deceptive game).

3.3.2. Method

3.3.2.1. Participants

A preliminary power analysis employed using G*Power 3.1 (α = .05, power = .80) indicated that a minimum sample of N = 74 children would be needed for a multiple linear regression model with 6 predictors, to detect a small to medium effect of the relevant predictors (Cohen's f^2 = 0.11). We chose this effect size based on previous research reporting relatively small effects sizes for the association between children's lie-telling and socio-cognitive factors such as theory of mind and executive functions (Lee & Imuta, 2021; Sai et al., 2021). Written informed consent was obtained from each parent, as well as information about their child's age and gender. Seventy-five 6- to 8-year-old participants were included in this study (M_{age} = 90.67 months, SD = 6.63; age range between 80.21 and 107.60 months; 34 boys and 41 girls). Children came from two urban schools in Cluj-Napoca, Romania. They were all Romanian native speakers. Demographical data collected showed that all participants came from middle-to-high-income families. Children's caregivers gave written informed consent for their children's participation in the study. The children also gave verbal consent prior to their participation. The study was approved by the university's ethics committee (approval number 5439).

3.3.2.2. Procedure

After obtaining parental consent and children's verbal assent, participants were tested in a quiet room at their respective schools. The individual testing session started with the deceptive behavior computerized task, followed by the visuospatial working memory task. Next, the theory of mind stories were read. Finally, the session ended with the inhibition and cognitive flexibility task (see below). We chose this administration order of the tasks to ensure that children's performance in the deceptive game would not be affected by the completion of the other tasks. More so, we avoided having two consecutive executive functioning tasks in order to prevent practice effects.

3.3.2.3. Measures

Strategic Peer Deception

Children's strategic deceptive behavior was measured using the *Cartoon Heroes* cards game. This was a new hide-and-seek computerized game we developed to elicit and assess various misleading strategies simultaneously. The game encompassed 1 practice round and 4 experimental rounds played with two different opponent dyads. The game had two versions: one featuring female opponents and the other featuring male opponents, tailored to align with the participants' respective genders.

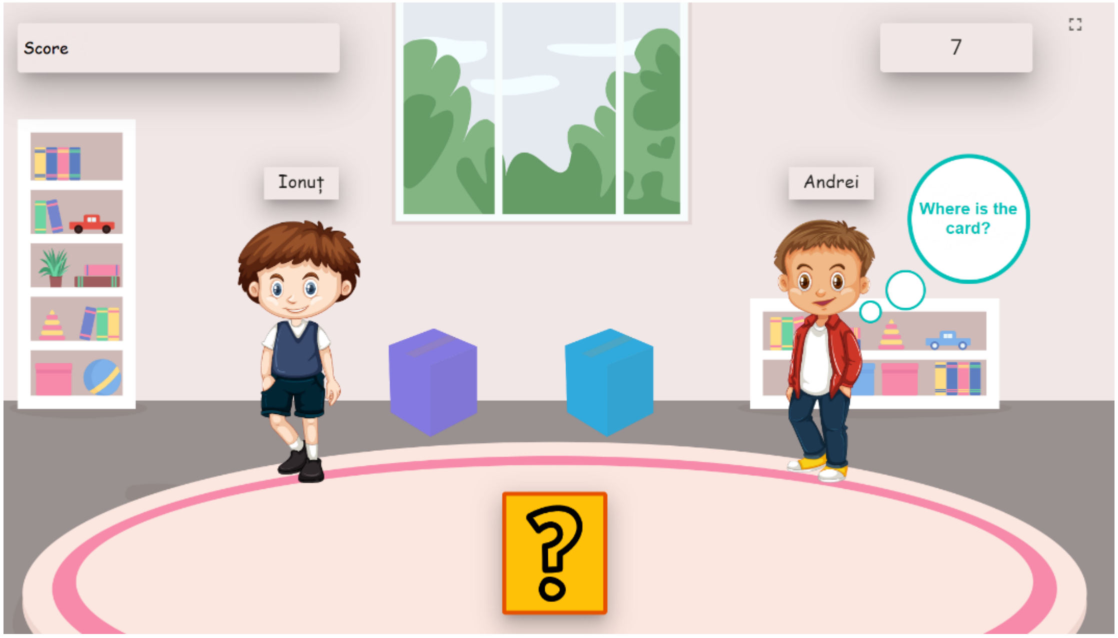
In the *game's preparatory stage*, participants were asked to name a friend or classmate with whom they got along very well. After that, they were presented with 15 cartoon characters on the computer screen. Children were first asked to choose 5 of the 15 characters they liked the most by clicking on them using a mouse. Next, they were asked to choose another 5 of the 10 remaining characters that they did not like. The cartoon characters used in this game were selected based on children's cartoon preferences. To this end, we interviewed several 6-8 years old children from three primary schools before developing the game to choose the most widely known, liked, and disliked cartoon characters for that age range.

Next, children were introduced to a *practice round* played with two default players (the same for all participants) of unknown familiarity and during which participants received feedback on their performance across 5 trials. Participants were told the game would involve several cards depicting their previously chosen, liked, and disliked cartoon characters and two opponents interested in keeping the cards for themselves. First, children clicked on a cards deck to reveal a card depicting a specific character (liked or disliked) from a pack in the center of the screen. Next, they clicked on one of two boxes (purple or blue) to place that card in them.

After they put the card in one of the boxes, one of two unknown opponents asked them: "*Where is the card?"* (see Figure 1) and they had to indicate one of the boxes by pressing the purple key (for indicating the purple box) or the blue key (for indicating the blue box) within 10 seconds. If the 10 seconds for answering the player's question were exceeded, the message "*Time is up!*" appeared on the screen, and a new trial began (children were instructed to click on the cards deck again). If so, the child lost the point corresponding to that trial. During this practice trial, a timer appeared in the upper right corner of the screen, counting down the seconds, and after each trial, children were informed if they won or lost the point according to the rules explained below. The practice round was employed to familiarize participants with the game's rules and ensure they understood how to play it. Lastly, to reduce children's reluctance to deceive in the presence of others, they were told that the trials played against one of the opponents could not be seen by the other opponent (both opponents were instructed not to look to the participants' actions when hiding the cards in one of the two boxes, and that the game was designed so that and they could not do that).

Figure 3.3.1.

The Cartoon Heroes Cards Game Setting in the Practice Round



During the practice round, the two opponents followed the children's indications about each card's location and opened the indicated box (*opponents' action: same*). If the opponent found the card after following the child's indication, they kept it for themselves. In order to win points, participants were instructed to secure as many cards as possible picturing their favorite cartoon characters (the *liked cards*) and as few cards as possible picturing their disliked cartoon characters (the *disliked cards*). Points were won if children kept the cards picturing their favorite characters but gave the opponents the cards with the disliked cartoon characters. Lastly, participants were told that if they won at least 5 points in each round, they would receive physical stickers picturing their favorite cartoon characters. They received one of the stickers at the end of the practice round in order to motivate them and the others (with a maximum of 4 additional stickers to be gained) at the end of the game, depending on their performance. Only during the practice round, the game showed "*You won this card!*" or "*You lost this card!*" messages on the screen after each trial, which the experimenter read aloud.

We introduced the first two personalized opponents in the game's *first game round*. Participants were informed that they would play this round against two new opponents, appearing on the screen's left and right sides. Children were told to imagine that one of the players was the friend or classmate they mentioned at the beginning of the game (using the name the child initially provided) and that the other was an unfamiliar child studying at another school. The participants were then asked to choose an avatar from four options for each player and give them names (they typed the friend's name and a random name for the unfamiliar opponent). For the familiar opponent, participants were prompted to choose the avatar that resembled the most their friend/best classmate, whereas for the unfamiliar opponent they were asked to choose it randomly.

The *first round* of the game included 10 trials. The procedure was similar to the practice round, except there was no feedback after the participants' actions, and the timer disappeared from the screen. In this round, they played against the familiar opponent (friend/classmate) in the first trial, followed by the unfamiliar opponent in the second trial.

The ***familiar opponent*** always followed the participant's indications by checking their suggested box (*opponent's action: same*). Consequently, if the participant drew a card picturing a *liked* character, they had to indicate the wrong location to mislead the familiar opponent and keep the card to win a point (*participant's action: false pointing*). However, if the child drew a card with a *disliked* cartoon character, they had to indicate the actual location of the card to their friend in order to avoid being left with it and losing the point (*participant's action: true pointing*). In contrast, the ***unfamiliar opponent*** did not follow the participants' indications regarding the cards' location. Notably, the opponent always checked the opposite box from the one indicated by the child (*opponent's action: opposite*). Consequently, if the participant drew a *liked* card, they had to indicate the correct location to mislead them and keep the card (*participant's action: true pointing*). On the other hand, if the participant drew a card with a *disliked* cartoon character, they had to point to the card's wrong location to avoid being left with it (*participant's action: false pointing*).

In the *2nd game round*, the participants were introduced to a new pair of personalized opponents. Children were informed that they would play that round with two other unfamiliar peers from other schools who would appear on the left and right sides of the screen. The participants chose an avatar for each opponent and gave them random names. Here, children were reminded which avatars they chose in the previous round for that dyad of opponents and prompted to use different ones from the avatar chosen for their friend. The second round also encompassed 10 trials.

Again, the unfamiliar opponent from ***the left side*** of the screen always checked the *box indicated by the child*. Consequently, if the participant drew a card picturing a *liked* character, they had to indicate the *false location* of the card to mislead the opponent and keep the card. However, if the participant drew a card picturing a *disliked* cartoon character, they had to indicate the *actual location* of the card to avoid keeping it and losing the point. The unfamiliar opponent from ***the right side*** of the screen always checked the *opposite box* to the one indicated by the child, so if the participant drew a card with a *liked* cartoon character, they had to indicate the *true location* of the card to mislead the opponent. If the participant drew a card with a *disliked* character, they had to point to the *false location* to avoid keeping it and losing the point.

The 3^{rd} *game round* was very similar to the first round, thus containing the familiar opponent (friend/classmate) and the unfamiliar opponent but changing their order. The unfamiliar opponent (right side) was now the first to ask the child where they put the card.

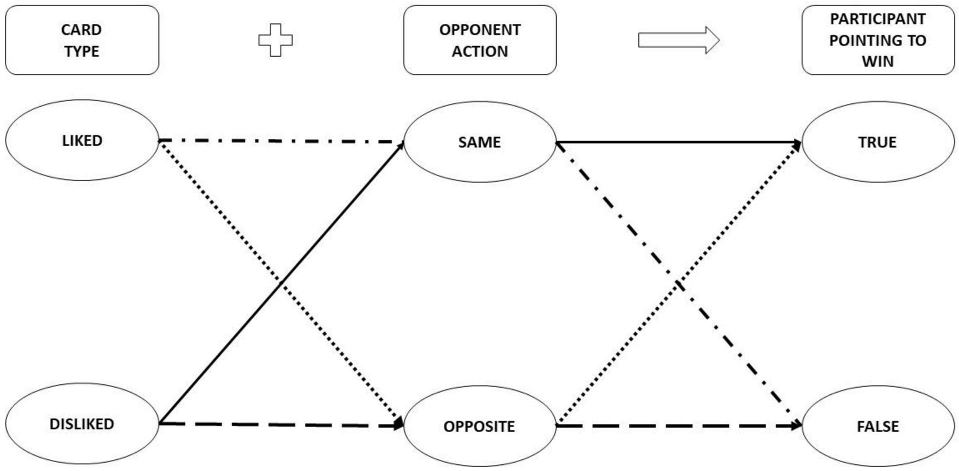
The 4^{th} *experimental round* was very similar to the second round. However, participants played the first trial of this round against the opponent from the right side of the screen, whereas the opponent from the left played the second trial.

Finally, in the game's *final stage,* the child was shown the 15 cartoon characters on the screen again, asking them to choose the liked and disliked characters as they did at the beginning of the game. This ensured they were constant with what characters they liked and disliked across the game and tested their memory for their preferences.

Participants received 1 point for each successful trial. Successful trials were considered those in which children determined others not to find the cards with their liked cartoon characters but made them find the cards depicting their disliked cartoon characters. Based on the points accumulated, participants had a score for each type of action employed during the game, depending on the combination of the card's type (liked vs. disliked) and opponents' actions (same vs. opposite): *LikedSame, DislikedSame*, *LikedOpposite*, *DislikedOpposite* (see Figure 2).

Figure 3.3.2.

Participants' Indications to Win in the Deceptive Game Depending on the Type of Card and the Opponents' Actions



First- and Second-Order Theory of Mind

The Sally and Anne task assessed children's understanding of first-order false beliefs (Baron-Cohen et al., 1985). The initial Baron-Cohen et al. (1985) narrative was slightly modified: instead of hiding a marble, Anne was hiding a ball, making the story more familiar to the children. The procedure and the scoring were carried out according to the instructions, which call for a children's verbal response to the control question (*Where did Anne place the ball?*) and the experimental question (*Upon return, where will Sally seek the ball?*). Children's performance was scored as 1 if they responded correctly to the control and experimental questions and as 0 if they responded incorrectly to one of the questions.

Second-order false belief understanding was evaluated using the "John thinks that Mary thinks that…" paradigm (Perner & Wimmer, 1985). The story was read to each subject, and several control questions were asked along the story (e.g., *Where is Mary now?; Did John know that Mary met with the ice-cream truck driver?*). Children's responses to the experimental question (*Where will John look for Mary?*) were coded as 1 if they gave the correct answer (e.g., *at the park*) and 0 if they gave the wrong answer (e.g., *at the school*).

Visuospatial Working Memory

The Corsi block-tapping task (Corsi, 1973) was used to assess children's visuospatial memory. The task was employed using a plastic board with nine blue blokes attached. The blocks were numbered on one side so that only the examiner could see them. Across several sequences of increasing length, the experimenter tapped out several blocks while the participant observed. The participant was then instructed to tap out the sequence in the same order as the experimenter. The shortest sequence involved tapping 3 blocks, whereas the longest had 9 blocks. For each correctly tapped sequence, participants received 1 point. The total score represented the sum of the correctly tapped sequences.

We specifically selected this task in order to assess children's visuospatial working memory based on previous research showing that this type of task is more cognitive demanding than other span tasks (e.g., Visu-Petra et al., 2011). Additionally, it taps into their ability to retain the specific locations of the experimenter's actions (e.g., tapping), which is relatively similar to their task on the hide-and-seek game where they had to keep in mind where they hid the cards in order to provide the adequate indications to the opponents and win points. More importantly, it is a non-verbal task which can minimize verbal skill impact on children's performance.

Inhibitory Control and Cognitive Flexibility

The Inhibition and Shifting task from NEPSY II (Developmental Neuropsychological Assessment II; Korkman et al., 2007) was used to assess children's ability to inhibit and flexibly switch between responses. The Inhibitory Control trial contained a display of black-and-white shapes (squares and circles), and children were asked to provide the opposite name for each shape (say 'circle' instead of square and 'square' instead of a circle). In the Shifting trial, children were instructed to correctly name the black shapes and provide the opposite name for the white ones (say 'circle' to a black circle and 'square' to a white circle). Next, the same kind of trials and instructions were applied to a new display of upward and downward arrows.

We recorded the completion time for each test trial along with the children's corrected and uncorrected errors. Efficiency scores were computed by dividing the completion time by accuracy (the maximum score minus the total number of corrected and uncorrected errors for each variable).

3.3.2.4. Statistical Analyses

In order to test the relationship between children's performance in the hide-and-seek game and socio-cognitive factors due to the dependencies in our data, we first employed a mixed model linear analysis with random intercept for participants (see Table S2 from Supplementary Materials). However, given the complexity of the model, the analysis yielded singular fit, so we could not accurately interpret the random and the fixed effects. Therefore, following the recommendations from the literature, we switched to a fixed-effect model (Oberpriller et al., 2022). To compare children's deceptive willingness to deceive familiar vs. unfamiliar opponents, a repeated measures ANOVA was employed. Lastly, we performed interaction analyses in order to test the conditional effects of trial type on the relations between children's performance in the game and socio-cognitive factors while controlling for the main effects of the other variables assessed. The analyses were run in R, version 4.2.1 (R Core Team, 2023).

3.3.3. Results

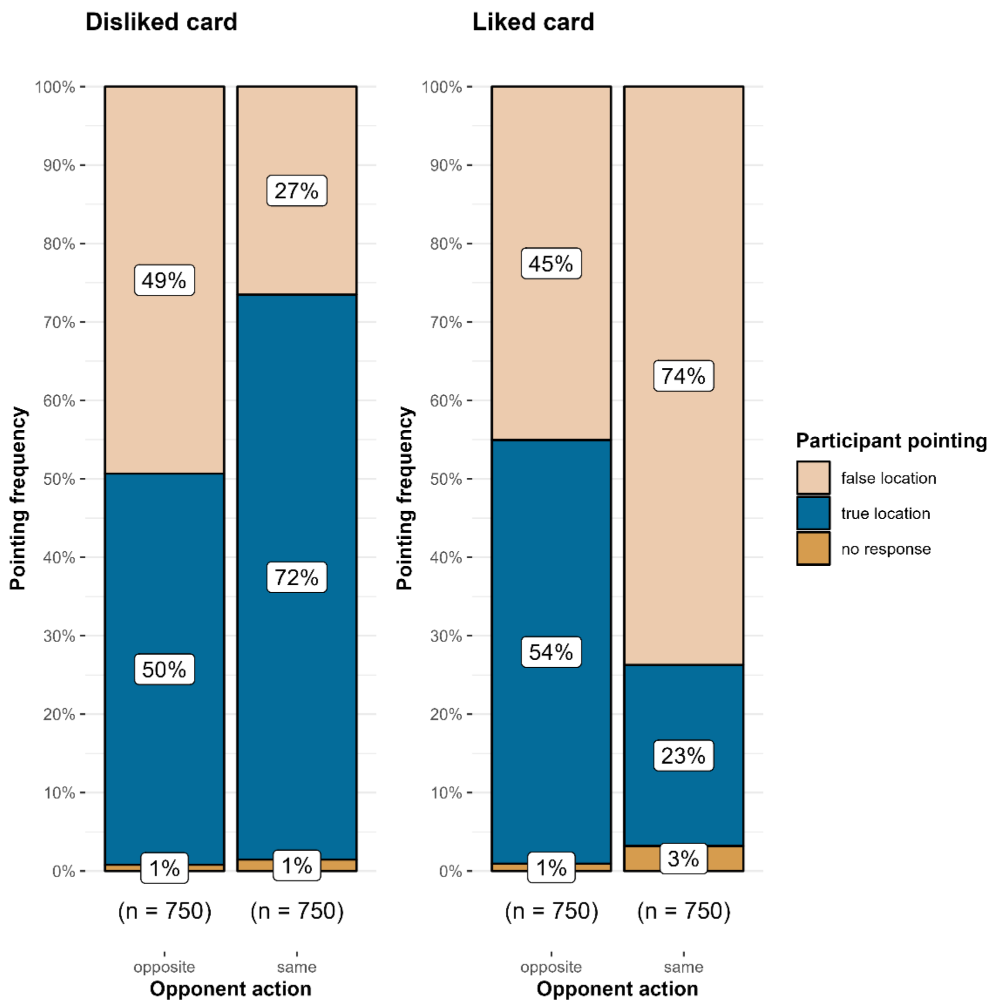
Preliminary data analyses revealed no age and gender-related effects. Thus, the data for all age groups and male and female participants were combined for all subsequent analyses.

3.3.3.1. Descriptive Analysis of Children's Performance in the Hide-and-Seek Game

In order to win points in the hide-and-seek game, children chose to indicate the true or the false location of the card depending on the card type, the opponents' actions, and the opponents' familiarity. Our preliminary results indicated a significant difference in children's pointing to the location of the cards depending on the card type, opponents' actions, and familiarity (see Supplementary materials). Given that, we intersected card type and opponents' actions to have a clearer understanding of children's behavior in the hide-and-seek game. Results represented in Figure 3 confirm that children adopted specific strategies to keep the liked cards and give away the disliked cards to win games while considering the opponents' actions.

Figure 3.

The Participants' Frequencies in Pointing to the Cards' Location Depending on the Interaction Between the Cards' Type and Opponents' Action



In terms of children's performance (the number of points won), the general trend showed that their proportion of successful trials across the game was 0.62, meaning that children successfully deceived the opponents in approximately 25 of the 40 trials. Table 1 contains the descriptive data of children's performance (the number of successful trials divided by the total number of trials) as a function of card type, opponents' actions, and opponents' familiarity.

Table 1. *Participants' Performance in the Deceptive Game Across Different Cards' Type, Opponents' Actions, and Opponents' Familiarity*

		M	*SD*
Card type	liked	0.641	0.479
	disliked	0.606	0.488
Opponent's action	same	0.731	0.443
	opposite	0.516	0.499
Opponent's familiarity	familiar	0.693	0.217
	unfamiliar*	0.769	0.194

* The unfamiliar score represents children's performance on the trials played against the unfamiliar opponent from Rounds 2 and 3 while following their indications, thus matching the familiar opponent's actions from Rounds 1 and 3

At the intersection between card type and opponents' actions, in order to win points, children needed to employ specific misleading strategies. Their performance based on the four possible combinations between card type and opponents' actions is displayed in Table 2. Lastly, Table 3 summarizes the descriptive data for the socio-cognitive factors included in the current investigation.

Table 2. *Participants' Performance in the Deceptive Game in Function of Cards' Type and Opponents' Action*

Card type	Opponents' action					
	Same			Opposite		
	M	Median	SD	M	Median	SD
Liked	0.742	0.8	0.198	0.540	0.6	0.310
Disliked	0.720	0.8	0.221	0.493	0.5	0.262

Table 3. *Descriptive Statistics for the Socio-Cognitive Measurements*

	M	*SD*
First-order false belief understanding	0.680	0.469
Second-order false belief understanding	0.600	0.493
Visuospatial working memory	8.173	2.055
Inhibitory control	2.529	0.792
Cognitive flexibility	4.373	1.383

We initially examined if there was a significant main effect of card type, opponent's action, and opponents' familiarity on children's performance in the hide-and-seek game. A linear regression analysis showed significant effects for all three predictors – card type ($\beta = 0.03$, $p = .044$), opponents' action ($\beta = 0.25$, $p < .001$), and opponents' familiarity ($\beta = -0.07$, $p = .001$), $R^2 = 0.053$. However, no interaction effects were significant.

Considering the significant main effects, in order to assess children's deceptive strategies employed during the hide-and-seek game and their relation to children's performance, we computed a *trial-type* variable stemming from the four possible combinations between card type and opponents' actions. Therefore, we had the *Liked-Same-F* trial type for cases where the card type was liked and the opponent's action was the same as the children's indication. To win points for these trials, children had to indicate the *false location* of the cards. A second trial type was the *Disliked-Same-T,* in which the card type was disliked, but the opponent's action was the same, so children had to indicate the *true location* of the card to win points. Finally, we had two more trial types in which the opponents acted opposite from the children's indications. One was the *Liked-Opposite-T* trials on which the card type was liked, while the opponent's action was opposite, and for which children had to indicate the *true location* of the card to win. Lastly, there were the *Disliked-Opposite-F* trials with the card type disliked, and the opponent's action opposite, in which children had to indicate the *false location* of the card to win points (see Table 4 for a summary of trial types and their specifications).

Table 4. *The Hide-and-Seek Trial Types and Their Specifications and Requested Responses*

Trial type	Card type	Opponents' action	Children's indications to win points
Liked-Same-F	Liked	Same (follow indication)	F
Disliked-Same-T	Disliked	Same (follow indication)	T
Liked-Opposite-T	Liked	Opposite (not follow indication)	T
Disliked-Opposite-F	Disliked	Opposite (not follow indication)	F

Note: F = false location; T = true location

To further test the effect of opponents' action, we employed a repeated measures ANOVA assessing the difference between children's propensity to deceive the opponents depending on their actions. To this end, we compared their scores on the *Liked-Same-F, Disliked-Same-T, Liked-Opposite-T*, and *Disliked-Opposite-F* trials which were played with unfamiliar peers in Rounds 2 and 4. This was done in order to exclude the influence of the opponents' familiarity on their performance. Results showed a significant difference in children's deceptive propensity, $F(2.242, 179.26) = 27.53$, $p < .001$, partial $\eta^2 = .27$. Bonferroni-corrected post-hoc comparisons revealed significant differences between children's scores on the *Same* and *Opposite* trials when playing with *Liked* and *Disliked* cards. When playing with *Liked* cards, children performed better within the trials where the opponent followed their pointing ($M = 0.73$; $SD = 0.23$) than when the opponent acted in opposition with their pointing about the cards' location ($M = 0.57$; $SD = 0.32$). Similarly, with *Disliked* cards, children had higher scores when the opponent followed their indications ($M = 0.78$; $SD = 0.23$) than when they did the opposite ($M = 0.46$; $SD = 0.31$). This might be indicative of children's difficulty to mislead the opponents when they did not follow participants' indications about the cards' location.

3.3.3.2. Differences Between Children's Deceptive Behavior Toward Familiar and Unfamiliar Peers

Table 5 depicts children's deceptive behavior as a function of card type and opponents' familiarity, which are indicative of their propensity to lie to familiar vs. unfamiliar peers for specific cards.

Table 5. *Participants' Performance in the Deceptive Game in Function of Cards' Type and Opponents' Familiarity*

Card type	Opponents' familiarity					
	Familiar			Unfamiliar*		
	M	Median	SD	M	Median	SD
Liked	0.675	0.8	0.245	0.784	0.8	0.247
Disliked	0.688	0.8	0.308	0.728	0.8	0.236

* The unfamiliar score represents children's performance on the trials played against the unfamiliar opponent from Rounds 2 and 3 while following their indications, thus matching the familiar opponent's actions from Rounds 1 and 3

A repeated measures ANOVA was employed in order to test for significant differences in children's deceptive behavior due to the opponents' ***familiarity*** in the *Liked-Same-F* and *Disliked-Sam*e-*T* trials. We selected only these types of trials because the familiar opponent's actions were always "same", meaning that they followed children's indications about the location of the cards. The task did not include familiar opponents who acted in opposition and thus, we did not include the *Liked-Opposite-T* and *Disliked-Opposite-F* with the unfamiliar opponents from those trials in this analysis. Results showed a significant difference, F(2.30, 74) = 4.69, p = .007, partial η^2 = .06. Post-hoc comparisons using the Bonferroni correction indicated that the only significant difference was between familiar and unfamiliar opponents in the *Liked-Same-F* trials, where children had to indicate the false location of the liked cards to keep them and win the points. Participants had better performance when playing these kinds of trials with the unfamiliar peer (M = 0.784, SD = 0.247) than with the familiar peer (M = 0.675, SD = 0.245). To sum up, children were more prone to mislead unfamiliar peers than familiar peers for liked cards, although this difference was no longer significant for disliked cards. This was in line with our prediction regarding children's increased propensity to deceive unfamiliar peers compared to familiar ones.

3.3.3.3. Relations of Socio-Cognitive Measures to Children's Deceptive Behavior in the Deceptive Game

To examine the relationship between children's performance in the hide-and-seek game and its socio-cognitive correlates, a linear regression was conducted with the children's proportion scores as the predicted variable. Each participant had four performance scores (mean performance) corresponding to the trial types in the game. We introduced as predictors the trial type, first- and second-order false belief understanding scores, inhibitory control and cognitive flexibility efficiency scores, and the visuospatial working memory score. The overall model was significant, $F(8, 291) = 18.95$, R^2 adjusted = 0.32, $p < .001$. From the trial types, only the *Liked-Opposite-T* (β = -0.18, CI 95% [-0.25; -0.11], $p < .001$) and the *Disliked-Opposite-F* (β = -0.23, CI 95% [-0.30; -0.15], $p < .001$) significantly predicted variability in children's performance. More specifically, both types of trials negatively predicted children's proportion of successful trials, which is also mirrored by the descriptive data in Table 2.

With regard to the socio-cognitive factors, we initially predicted that ToM and EFs (inhibitory control, working memory, and cognitive flexibility) would significantly predict children's propensity to deceive the opponents for personal gain. Results showed that first-order false belief understanding (β = 0.08, CI 95% [0.02; 0.14], p = .012), second-order false belief understanding (β = 0.12, CI 95% [0.06; 0.18], p < .001), and visuospatial working memory (β = 0.02, CI 95% [0.01; 0.04], p = .004) positively predicted children's propensity to deceive. This means that children were overall more successful in deceiving their opponents with increasing performance in the ToM and working memory tasks. The cognitive flexibility efficiency score was marginally significant and negatively predicted children's deceptive behavior (β = -0.02, CI 95% [-0.05; 0.00], p = .058). As children took more time to complete the cognitive flexibility task, they were also less likely to mislead the opponents. The inhibitory control efficiency score was the only non-significant main effect (β = 0.02, CI 95% [-0.03; 0.06], p = .483).

Given the significant effects of certain trial types on children's performance in the deceptive game, we also tested the interaction effect between trial type and the socio-cognitive factors using the PROCESS function (Hayes' Model 1). In each model, we introduced children's proportion scores in the hide-and-seek game as the dependent variable, each socio-cognitive factor as the predictor, and trial type as the moderator. The remaining variables in each case were introduced as covariates. Across the models, results showed that all the main effects previously described remained significant. As for the interactions, our findings showed a significant interaction between inhibitory control and trial type, $F(3, 288) = 3.56$, p = .015, $R^2 = .34$, as well as a significant interaction between cognitive flexibility and trial type, $F(3, 288) = 5.80$, p < .001, $R^2 = .36$. Based on these interactions, simple slope analyses showed that inhibitory control (b = -.08, t = -2.44, p = .015; see Figure 4a) and cognitive flexibility (b = -.09, t = -4.04, p < .001; see Figure 4b) negatively predicted children's truthful pointing on the *Liked-Opposite-T* trials.

Figure 4a.

The Interaction Between Inhibitory Control Efficiency Score and Trial Type in Predicting Children's Performance in the Hide-and-Seek Game

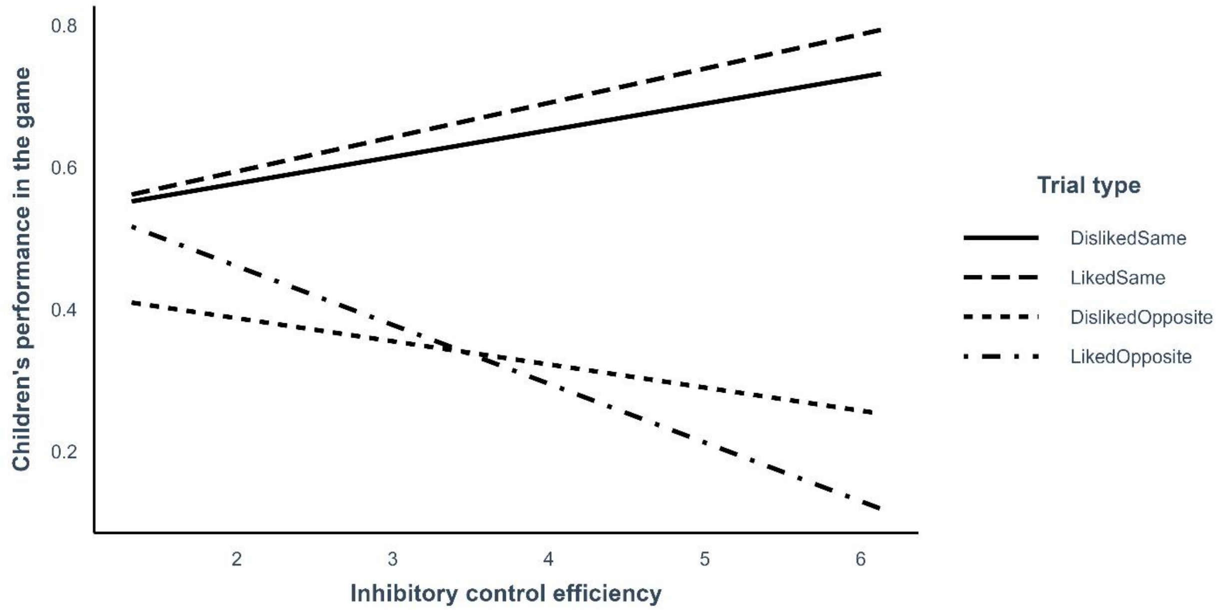
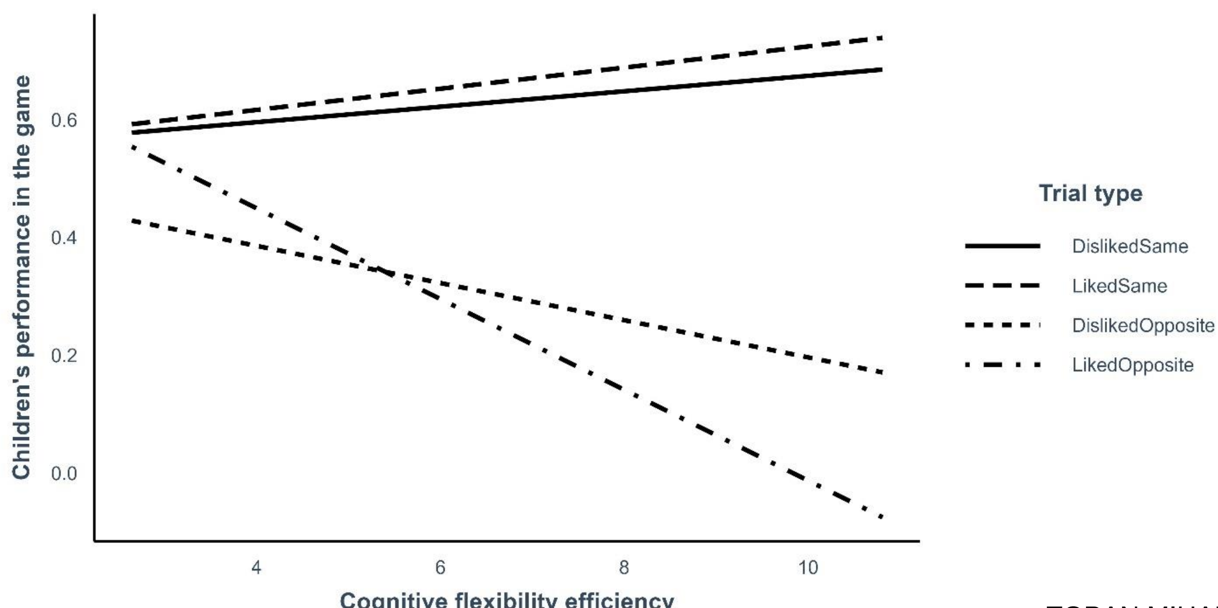


Figure 4b.

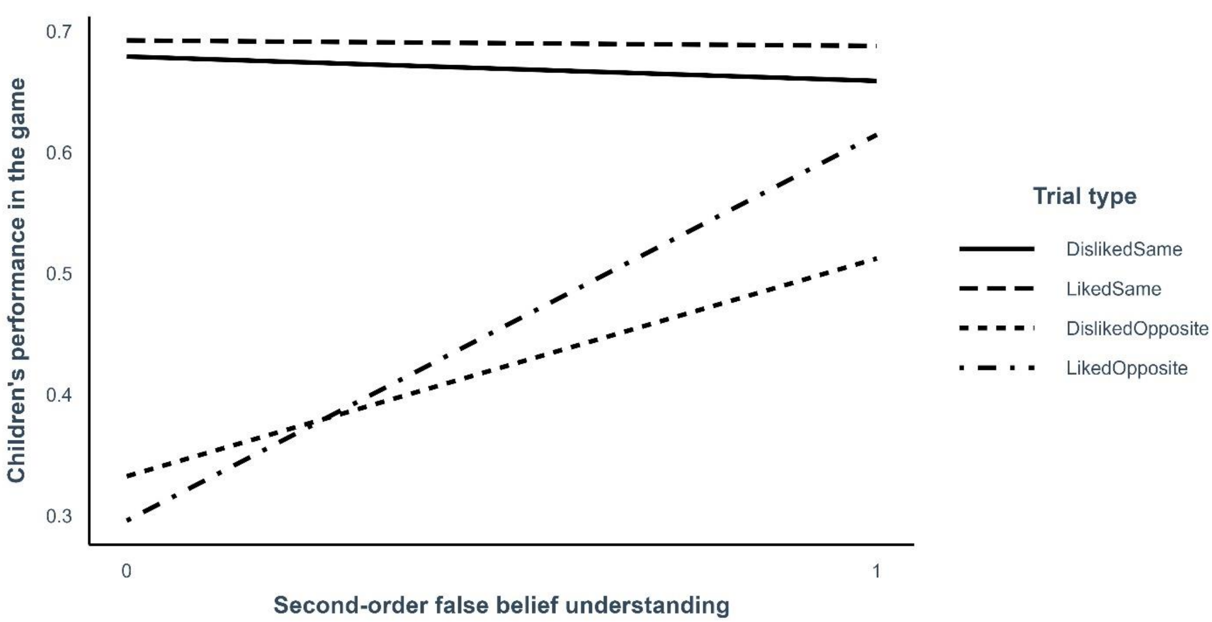
The Interaction Between Cognitive Flexibility Efficiency Score and Trial Type in Predicting Children's Performance in the Hide-and-Seek Game



In line with our prediction on the positive relation between second-order false belief understanding and children's propensity to tell the truth to deceive, results showed that ToM II significantly interacted with trial type, F(3, 288) = 10.18, p <.001, R^2 = .38, and that it positively predicted children's performance on the *Liked-Opposite-T* trials (b = .32, t = 6.10, p < .001; see Figure 4c) in which they needed to indicate the true location of the card to mislead the opponent. However, there was also a positive relation between second-order false belief understanding and their performance on the *Disliked-Opposite-F* trials (b = .18, t = 3.44, p < .001; see Figure 4c). In turn, despite our hypothesis that first-order false belief understanding would predict children's lie-telling when the opponents' action was "same", we did not obtain a significant interaction between trial type and this form of ToM.

Figure 4c.

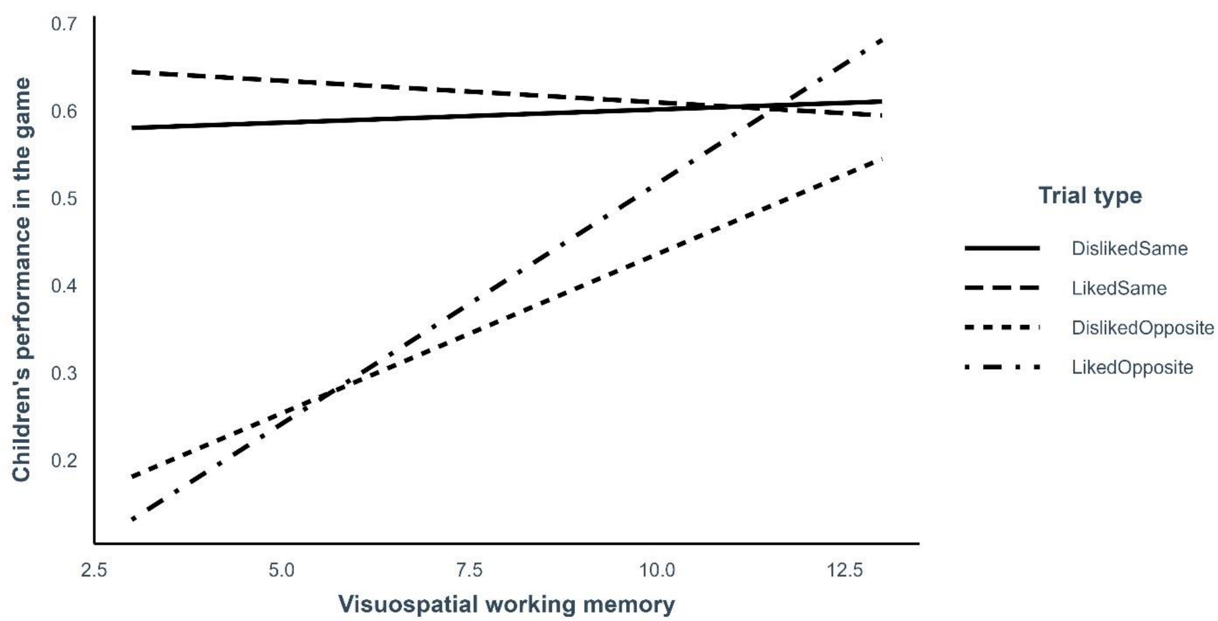
The Interaction Between Second-Order False Belief Understanding and Trial Type in Predicting Children's Performance in the Hide-and-Seek Game



Lastly, we obtained a significant interaction between visuospatial working memory and trial type, $F(3, 288) = 5.12$, $p = .002$, $R^2 = .35$. Visuospatial working memory positively predicted children's scores in the *Liked-Opposite-T* trials ($b = .05$, $t = 4.17$, $p < .001$) and *Liked-Opposite-F* trials ($b = .03$, $t = 2.76$, $p = .006$) (see Figure 4d).

Figure 4d.

The Interaction Between Visuospatial Working Memory and Trial Type in Predicting Children's Performance in the Hide-and-Seek Game



3.3.4. Discussion

Employing a zero-sum competitive deception game that involved rewards, we innovatively investigated children's ability to mislead familiar and unfamiliar peer opponents in a new hide-and-seek computerized paradigm. To maximize their chances of winning points during the game, participants had to decide which misleading strategy to use depending on the cards in the game

TOPAN MIHAELA
2023.10.16 13:33

(liked vs. disliked) and their peer opponents' actions (following or not the child's indications). Furthermore, given the game's setting, participants had to constantly switch between misleading strategies depending on the status and actions of the opponent they played against. Replicating previous evidence on children's peer relations, we found that children were less likely to deceive the familiar peer opponent than the unfamiliar one. In addition, the socio-cognitive factors assessed (theory of mind and executive functions) significantly predicted children's performance in the hide-and-seek game. Finally, extending previous deception studies, we showed that the socio-cognitive factors significantly predicted children's performance in the deceptive game only for some of the trials, informing on the possible mechanisms involved in their strategic deception toward peers in primary school years. Notably, children's second-order theory of mind and visuospatial working memory positively predicted children's deceptive behavior in the *Opposite* trials in which the opponents did not follow their indications about the cards' location.

During the hide-and-seek game, participants had to decide for each trial whether they would mislead the opponent in order to win points and, if so, which strategy would benefit them the most. Our findings suggest that our experimental manipulations significantly influenced children's performance in the deceptive task. At the beginning of the game, children were instructed to choose their liked and disliked cartoon characters, which were subsequently used as cards along trials. Results showed that the card type effect was significant for children's decisions to point to the true or false locations of the cards. More specifically, most children pointed to the true location of the card when they hid a disliked card (61% of the time), so the opponent would find it, and they would win a point. In turn, most of them pointed to the false location when they hid a liked card to be able to keep it and win (60% of the time; see Table S1 from Appendix C). Similarly, our manipulation regarding the peer opponents' actions in the game was also significant, with children indicating more the true location of the cards when the opponents did the opposite from what they suggested and pointing to the false location when the opponents followed their lead. Together, this evidence is indicative of children's motivation during the deceptive game, proving their willingness to win points and receive stickers with their favorite cartoon characters. In order to accumulate as many points as possible, children could employ four misleading strategies that resulted in the intersection between card type (liked vs. disliked) and opponents' action (same vs. opposite). Results showed that children performed better on the trials in which the opponents followed their indications of the cards' location compared to the trials in which the opponents did the opposite. This aligns with previous research (e.g., Leng et al., 2019 on children's truth-telling to deceive), suggesting that it was much more challenging for children to decide what indication to provide to their opponents when they did not follow their suggestions and that this was positively related to high-order ToM developments (e.g., second-order false belief understanding) and/or EFs (e.g., inhibitory control, cognitive flexibility, and visuospatial working memory).

3.3.4.1. Children's Strategic Deception Toward Familiar and Unfamiliar Peer

Our findings also revealed that children's performance was better when playing against an unfamiliar peer than against a familiar one when they both followed the participants' indications. A significant difference was obtained for the *Liked-Same-F* trials in which participants had to indicate the false location of the liked cards in order to keep them. Therefore, children deceived the familiar peer opponent (friend/best classmate) less than the unfamiliar one (the unknown child). Previous literature demonstrated that children's competitiveness increases with age, as much as the importance of peer relations. For instance, Nilsen and Valcke (2018) demonstrated that children could differentiate between cooperative and competitive relationships in primary school, sharing fewer resources with competitors than cooperators. However, the competitors' familiarity could also influence children's decisions. Fonzi et al. (1997) observed that 8-year-old friends displayed greater positive affect during competition than dyads of non-friends. However, defecting can also be detrimental to friendships if it is performance-oriented (when the competitors seek to outperform one another; Tassi & Schneider, 1997). In line with this evidence, considering the performance-based competition entailed by our game, results showed that when faced with a liked card, in 28% of cases, participants shared the true location with the familiar opponent compared to 18% for the unfamiliar opponent. This could be explained by previous literature demonstrating that children were more inclined to preserve their relationships with friends and share resources with them (Lavoie & Talwar, 2022; Perkins & Turiel, 2007). Another line of evidence supporting our results comes from children's evaluation of lies towards friends, with adolescents considering deception detrimental to their peer relations quality and being more reluctant to lie to them (Perkins & Turiel, 2007).

3.3.4.2. Socio-Cognitive Factors and Children's Strategic Deception

As previous literature suggested, strategical competition entails higher-order socio-cognitive abilities, such as mental state understanding or cognitive control (Fülöp, 2022). In the current investigation, we have successfully demonstrated that children's ability to compete against peers in a limited resources setting was significantly related to socio-cognitive factors such as theory of mind (first- and second-order false belief understanding) and executive functions (cognitive flexibility and visuospatial working memory). In order to win points during the game, children had to constantly infer the opponents' intentions and beliefs and choose the most appropriate response strategy. Also, by playing against two peer opponents in each round, they had to flexibly switch between those strategies in order to outperform each opponent who differed in their actions and keep in mind multiple pieces of information (in each round, one of the opponents followed children's indications regarding the whereabouts of the cards, while the other did not). This is congruent with previous research finding that children's competitive behavior is predicted by their ToM and EF abilities (Fülöp, 2022; Priewasser et al., 2013). For example, Fischer et al. (2018) showed that competitive goals increased 4-to-11-year-olds' cognitive control by motivating them to reach a particular goal. Competing against others may increase children's motivation and their propensity to adopt different perspectives and strategies to regulate their behavior.

The fact that our participants competed by employing different types of misleading behaviors makes it more informative for the deception research linking children's deceptive behavior to socio-cognitive sophistication (Visu-Petra et al., 2022; Talwar & Crossman, 2011). In line with our results, previous literature established that individuals must understand the recipient's mental state and anticipate their behavior based on these inferences when deceiving others. Moreover, they have to know that beliefs can be altered and that they can mislead others into believing something false to be true. Both first-order and second-order theory of mind understanding have been related to children's deceptive behavior (Lee & Imuta, 2021). For instance, Talwar et al. (2007) showed that elementary school children's ability to maintain an initial lie, which is much more complicated than simply denying a fact, was positively related to the advanced theory of mind developments, such as second-order false belief understanding. In addition, previous literature investigating children's deceptive ability when the opponent was knowledgeable about the deceiver's intent to mislead them demonstrated its reliance on rudimentary forms of second-order theory of mind, such as second-order ignorance (Prodan et al., 2024; Sai, Ding, et al., 2018). Lastly, it was also shown that in order to deceive others, good executive functions like cognitive flexibility or working memory are needed (Alloway, 2015; Christ et al., 2009). Cognitive flexibility could allow participants to switch between multiple demanding tasks, such as truthful and deceptive responses or multiple deceptive strategies. In contrast, working memory can allow children to juggle multiple pieces of information to mislead others successfully, even when the target suspects their intention to deceive them (Prodan et al., 2024).

Besides replicating previous findings on the association between children's strategic deception and socio-cognitive development, the current investigation extends those findings to demonstrate specific relations with the socio-cognitive factors depending on the type of trial children played. Despite the significant main effects obtained for the socio-cognitive factors in predicting children's overall performance in the deceptive game, when introducing the trial type, both theory of mind and executive functions significantly predicted children's performance only for some of the trials.

We hypothesized that ***first-order ToM*** and executive functions would be related to children's ability to use false information to mislead, similar to the deceptive strategy children had to employ during the *Liked-Same-F* trials. A growing body of evidence suggests that misleading others requires understanding false beliefs, as children who displayed this ability were more proficient lie-tellers (Lee & Imuta, 2021; Miller, 2022, p. 32). Nevertheless, the conditional effects we tested showed non-significant results for the *Liked-Same-F* and *Disliked-Same-T* trials in which the opponent followed the participants' indications and checked the box they pointed to. One possible explanation can be that these trials were the simplest ones, requiring less cognitive sophistication. In order to win points within those trials, perhaps children did not need to infer the opponents' mental states to mislead them. Instead, children could flexibly adjust their answers to the previous opponent's action while making inferences about their overt behavior and not their mental states (practical deception). This is somewhat consistent with other evidence showing that even young children can be deceptive without clearly understanding false beliefs (Evans & Lee, 2013; Newton et al., 2000; Sinclair, 1996). Moreover, given the repetitive actions within these trials, we can speculate a response suppression process rather than actively engaging in more complex executive functioning. Response suppression represents a subtype of inhibitory control that implies simply withholding a prepotent response in favor of another (Nigg, 2000), which could result in participants entering an "attentional inertia" state resulting in them simply pointing to the true/false location of the cards knowing that the opponent would always follow their indications (Diamond, 2013).

Nevertheless, our findings suggest that the existing errors, even on these easier trials, could result from children adopting an interpersonal perspective, which may be informative for the affective load imposed by the task. According to *affective load theory,* individuals can face feelings of uncertainty in pressuring environments multiplied by perceived time pressure (Parsons et al., 2022). Consistent with this notion, children's better performance against the unfamiliar, compared to the familiar opponent, was significant only for the *Liked-Same-F* trials in which children had to mislead opponents who followed their indications to keep the liked cards. This might add to the affective load because the liked cards were more salient for children to keep, some expressing their preference for certain cartoon characters that were used as stimuli during the game.

The significant conditional effects according to trial type were obtained only for the trials in which the opponent did not follow the participants' indications, constantly checking for the opposite box than the one they indicated. As predicted, ***second-order false belief understanding*** positively predicted children's performance on the *Liked-Opposite-T* and *Disliked-Opposite-F* trials. These findings align with previous research showing that deceiving a suspicious target, irrespective of the strategy used, is more demanding in terms of mentalizing abilities. In adult samples, a growing body of evidence demonstrated that being able to understand the mental states of someone who seems knowledgeable of the other's intention to deceive them requires advanced forms of theory of mind development and is positively associated with people's ability to implement deception in such a context (Ding, Sai, et al., 2014; Kireev et al., 2017; Sai, Wu et al., 2018). In children, the ability to alternate between truths and lies when trying to mislead a suspicious target was positively related to second-order ignorance attributions, which is a rudimentary form of the second-order theory of mind (Prodan et al., 2024; Sai, Ding, et al., 2018). Similar to the previous research contexts, our participants had to infer the opponents' mental states and anticipate their behavior while deciding what strategy to use (truthful pointing vs. deceptive pointing) depending on the card's type (liked vs. disliked), which increased the resulting cognitive load.

Regarding the effects of ***executive functions***, the only significant relationships obtained were for the *Liked-Opposite-T* trials in which children had to indicate the actual location of the cards to mislead the suspicious opponents and keep their preferred cards. A possible explanation for this could reside in the stimuli's nature. As for the *Liked/Disliked-Same-F/T* trials, the significant difference in children's performance was obtained only for the Liked-Same-F trials involving children's preferred cards. Here too, perhaps the increased salience of the stimuli made children's tasks even more complex and requested significantly more executive control than on the *Disliked-Opposite-F* trials, which involved children's disliked cards.

Pointing to the true location of the liked cards when the opponents did the opposite was negatively related to the inhibitory control and cognitive flexibility efficiency scores but positively to the visuospatial working memory performance. We calculated the inhibitory control and cognitive flexibility scores as the time it took children to perform the task over their accuracy (an efficiency measure). Therefore, our results suggest that the more time it took children to complete the executive functions tasks, the lower their performance was in the *Liked-Opposite-T* trials. This echoes previous research showing a positive link between children's executive abilities and lie-telling (Talwar et al., 2017; Sai et al., 2021). More so, Zheltyakova et al. (2020, 2022) suggested that telling the truth to deceive is more cognitively demanding than simply telling a lie by recruiting more advanced cognitive processes. However, previous research on children's ability to tell truths to deceive showed non-significant relations to inhibitory control or cognitive flexibility (Prodan et al., 2024; Sai, Ding, et al., 2018). A notable difference between previous and current investigations is the complexity of the tasks. Both studies on telling the truth to deceive focused on participants' ability to constantly alternate between truths and lies, using tasks in which this alternation was very predictable and easy to learn across trials. In turn, the present investigation analyzed children's truthful or deceptive actions in a more demanding, unpredictable way that entailed alternations both between and within opponents. Children had to alternate between deceiving the two opponents but also alternated between deceptive strategies with the same opponent depending on the card type across trials. Therefore, our task demanded more executive functions due to the higher cognitive load, which could explain the greater role of response inhibition and cognitive flexibility.

As hypothesized, we also obtained a positive relation with visuospatial working memory. When children had to indicate the true or false location to the suspicious opponents, visuospatial working memory allowed them to juggle multiple pieces of information, such as the spatial location of the card, the card type, and the opponent's beliefs about their intention to mislead them.

Considering the computerized game's specifics, the visuospatial working memory capacity was particularly important here. To be successful, children needed to ability to represent things in space and to keep in mind the spatial location of the cards when responding to the opponents' questions. This finding aligns with previous literature showing a positive association between children's working memory and their ability to deceive (Alloway et al., 2015). A possible explanation relating children's cognitive competence to their lie-telling proficiency is their capacity to simultaneously use several pieces of information (Keenan et al., 1998). As the number of items children can remember and process increases with age, children can expand their deceptive abilities through the number of aspects they can consider simultaneously. Keenan et al. (1998) suggested that increasing working memory capacity provides children with an increased capacity to communicate concepts that could not be transmitted due to their limited processing span. Supporting this, our supplementary analyses demonstrated that visuospatial working memory moderated the relationship between children's performance on the *Liked-Opposite-T* trials and second-order theory of mind (see Figure 2 from Appendix C). Further studies investigating these types of misleading strategies are needed in order to uncover the mechanisms behind children's ability to manipulate others' beliefs for personal gain by alternating between truths and lies.

In a leaner interpretation, our significant results with EFs could rely on the cognitive load imposed by the overall deceptive task, given its different components and rules to follow, rather than the actual deceptive actions employed. Nevertheless, the design of the current deceptive task rests on other hide-and-seek paradigms involving children's ability to alternate between truthful and false pointing to mislead an adult opponent (e.g., Prodan et al., 2024; Sai, Ding, et al., 2018). In both of these studies, researchers reported higher levels of children's accuracy in telling truths and lies to deceive (71% compared to 62% which is the children's general performance in the current study) and non-significant links between children's deceptive behavior and EFs (inhibitory control or cognitive flexibility) both in preschoolers and school-age children. As discussed in Prodan et al. (2024), children's ability to alternate between truths and lies could have different levels of sophistication. In its elementary forms (employed in previous literature so far; Leng et al., 2019; Sai, Ding, et al., 2018), it includes a flexible adaptation to the recipient's action and alternation between truth and false information. In the current investigation, we aimed to investigate a more sophisticated form of children's deception by allowing convoluted alternations between truth and false pointing as a function of stimuli likability, opponents' familiarity, and actions. This made deception more challenging to employ and, thus, increased the executive demand.

In addition, compared to similar hide-and-seek paradigms, the most notable innovation of the current deception paradigm is the presence of familiar and unfamiliar peers, which could also increase the cognitive costs associated with deception. Changing the motivational context could have increased children's task-unrelated thoughts (mind-wandering; Ye et al., 2014), leading participants to think about their peers, which could, in turn, inquire higher levels of executive control in order to inhibit them and complete the competitive game (Keulers & Jonkaman, 2019).

3.3.4.3. Limitations

Despite the notable findings on children's dishonest behavior in competitive settings involving peers, the current investigation has some limitations to note. First, our familiar/unfamiliar manipulation was not balanced across the design, which limited the investigation of this effect for all the trial types. Specifically, we did not include a familiar peer who opposed the participants' indication regarding the cards' location. This was made to increase the ecological validity of the game, mirroring everyday contexts in which friends usually trust one another and follow their guidance. Future improvements of the computerized game can include a familiar peer acting in opposition in order to capture the true variability in children's dishonesty when familiar peers trust them or not.

Our results suggested a significant difference in children's performance between misleading familiar vs. unfamiliar peers, but the difference was not extremely large (only a 10% difference). Children could have chosen the avatars based on their preferences and not by the resemblance with their familiar peers or randomly for the unfamiliar ones. This could have reduced the difference between children's propensity to lie to familiar vs. unfamiliar opponents. In order to enhance the manipulation regarding the opponents' familiarity, children could be asked additional questions about their friend/best classmate at the beginning of the game. This way, the memory of that friend would be more salient for children than it was in the current study. Similarly, to make sure that children are not thinking about someone familiar when choosing a random name for the unfamiliar peers, they could remain anonymous during the game, and their avatars could not be chosen by the participants (to have default avatars for unfamiliar opponents).

Another possible factor influencing children's propensity to deceive was the presence of the third-party neutral opponent. To mislead one opponent during the game, children had to deceptively/truthfully point to one of the boxes in the presence of the second opponent. Even though we stressed that the second opponent could not see children's critical actions (e.g., where did they hide the card in the first place), we acknowledge that this may have influenced children's propensity to deceive while having witnesses. Nevertheless, evidence from child and adult samples reported non-significant effects of others' presence on children's decision to deceive (Ding et al., 2019; Xiong et al., 2022). For example, while testing two honesty-promoting techniques (e.g., self-awareness vs. other-awareness), Ding et al. (2019) found no difference between the control group and other-awareness group (or peer condition) in which children were faced with a peer's photograph (a classmate) in front of them while playing a guessing game and having the chance to deceive the experimenter. Further research is needed to extend our current limited understanding of children's deception toward peers in the presence of other parties. In this respect, it might be insightful to test children's propensity to deceive in different conditions of the same motivational context: children's deception in a dyadic interaction with a peer vs. their deceptive behavior in a group setting (similar to the current setting with two peers at once).

Lastly, the restrictive age range in the current investigation did not allow us to capture age-related differences in children's strategic deception toward peers. Nevertheless, current findings build upon our limited understanding of primary school-age children's dishonest behavior in peer relations and their decision when competing for limited resources by offering a preliminary insight into the mechanisms of deception in such contexts. Future research could expand the age range and investigate longitudinal patterns in larger samples in order to highlight the dynamics of children's peer relations and deception across development.

3.3.4.4. Implications

The current findings complement the body of research on children's peer relations by showing evidence of children's social peer preferences from early primary school-age years. Even though children's friendships are not well-established at this age, our findings bring an essential insight into the importance of peer relations at the beginning of school years. In addition, this evidence has implications for deception research by contributing to our current limited understanding of children's deceptive behavior toward peers. The fact that children deceived their familiar peers less than the unfamiliar ones adds to the previous evidence indicating children's understanding of the value of honesty in egalitarian relationships, such as friendships (Bagwell &

Schmidt, 2013; Fink, 2021). Across development, children's friendships become increasingly salient and intimate, providing a safe space to explore identity and self-understanding. To this end, our evidence indicated that even when competing for limited resources, children value the quality of their friendships and the importance of sharing and honesty with friends. Nevertheless, the current results should be treated with caution considering the small difference in lie-telling percentages between familiar and unfamiliar peers (only 10% difference). This may be due to the relatively weak familiarity effect induced, but more research is needed to unfold these potential differences. However, the current investigation provides preliminary evidence of this familiarity effect on children's deceptive propensity, setting the stage for future explorations.

From a methodological perspective, the current study offers a new playful, ecological setting for investigating children's strategic deception in competitive contexts. Previous research demonstrated that playful peer competition is an essential hallmark of healthy child development as it facilitates moral learning and perspective-taking (Lobel et al., 2019). Thus, the newly developed competitive game represents an ecological method for assessing children's propensity and proficiency to mislead peers, resembling actual games they play and involving salient stimuli for this age range, which are very easy to customize and adapt for older children as well. More so, it allows for assessing multiple forms of behavioral deception while simulating complex social interactions in which children could mislead a target in the presence of another person. In the current design, the opponents were neutral so that children's decision to deceive one opponent did not affect the other opponent's points in the game. Xiong et al. (2022) demonstrated that people's decision to lie was influenced by the presence of a third-party beneficiary/victim, being more willing to lie in the presence of a third-party beneficiary of their deceit. Nevertheless, introducing a neutral third party did not affect the participants' decision to deceive. Future research could also explore these effects on children's decisions to deceive by manipulating the number of players in the game and their roles (beneficiaries or victims of the participants' deceptive behavior).

Lastly, the current study simultaneously explored multiple forms of deception, from the simplest one involving pointing to the wrong location of the cards to an unsuspicious target to the more complex one in which children could infer the opponents' knowledge about their intentions deceive and subsequently use true and false information to mislead the opponents and win points. Our findings suggest that these types of misleading behavior were differently associated with socio-cognitive factors, with only the most complex and cognitively demanding one being associated with theory of mind and executive functions.

3.3.4.5. Conclusion

The current investigation focused on children's lie-telling behavior in highly competitive settings involving familiar and unfamiliar peers. The primary question addressed children's deceptive propensity towards peers, which was – to the best of our knowledge – not yet experimentally assessed by previous literature. More so, we tested the extent to which children would modulate their deceptive actions depending on the target's familiarity (familiar vs. unfamiliar peer) and actions (opponents that followed indications vs. not followed indications). Second, we aimed to address the socio-cognitive correlates of children's deceptive behavior in this setting and extend this line of inquiry by assessing more nuanced relations between children's socio-cognitive skills and specific deceptive strategies.

In summary, our findings suggested that primary school children were less likely to deceive a familiar opponent than an unfamiliar one when competing for limited resources in a competitive game. Extending previous literature on the association between children's deceptive behavior and socio-cognitive development, our findings showed that participants' ability to implement complex deceptive strategies (e.g., alternating between truths and lies to deceive) was positively predicted by their socio-cognitive skills (second-order false belief understanding and visuospatial working memory). Next, children's propensity to mislead others by resting on truthful information was significantly predicted by their executive functioning, aligning with the literature stating the increased cognitive load associated with this deceptive strategy (Voltz et al., 2015; Ding, Sai, et al., 2014). Further research investigating children's deceptive behavior in peer relations is needed to fully understand how this behavior evolves, as children's peer relationships become increasingly important and how they choose to employ it depending on peer familiarity.

Study 4: Interpretive diversity understanding, parental practices, and contextual factors involved in primary school-age children's cheating and lying behavior

3.4.1. Introduction[11]

A fundamental premise of children's social development is the ability to achieve various self-directed goals while adhering to social norms. Following social rules and expectations represents one of the most important social behavior children learn early at home, and later in school (Harris & Núntez, 1996). However, despite constant encouragement to follow them, children still have difficulties negotiating between their early egocentric tendencies and social requirements with implications in various settings, such as school environment. For instance, previous research has documented high rates of cheating and lying about it from an early age when children primarily seek to avoid imminent punishment or to obtain a personal gain (Talwar & Lee, 2002). Dishonesty is a normative part of a child's development, being considered a marker of their cognitive competence (Talwar & Crossman, 2011; Visu-Petra et al., 2022). In laboratory settings, children's deceptive behavior has been studied using the seminal temptation resistance paradigm (TRP; Lewis et al., 1989), implemented either via Guessing games (frequently used in preschoolers; Ding et al., 2014) or Trivia games (more suitable for older children; Evans & Lee, 2011). In the latter ones, participants are asked to respond to several multiple-choice questions in order to win a desirable prize. However, during the task, they are offered the possibility to cheat by peeking at the answers for the more difficult questions during a brief experimenter's absence.

[11] The content of this sub-chapter represents in its entirety the manuscript: Interpretive diversity understanding, parental practices, and contextual factors involved in primary school-age children's cheating and lying behavior, published by Prodan, N., Moldovan, M., Cacuci, S. A., & Visu-Petra, L., in the year (2022), in the journal: *Journal of Investigation in Health, Psychology and Education*, *12*(11), https://doi.org/10.3390/ejihpe12110114

The TRP paradigm addresses three deceptive acts that differ in their complexity. At first, children have to decide if they are going to peek or not at the correct answers, which involves cheating. Past research showed that children's decision to cheat is highly related to their motivation to win, inhibitory control, or personality traits (Callender et al., 2010; Zhao et at., 2017). The decision to cheat sometimes comes with a second challenge – lie-telling. When deciding to lie or not about their transgression, school-age children are beginning to guide their decisions based on a quasi-rational process involving the plausibility principle. They are becoming increasingly capable of contrasting costs and benefits and deciding if it is worth taking the risk based on social context (Walczyk & Fargerson, 2019). As such, even if children cheat on a game, they could decide not to lie about doing so if there is a chance to be easily discovered. Lastly, if lying occurs, children must be able to sustain that lie if the recipient decides to ask for details, generating what is known as *semantic leakage control* (Talwar et al., 2007; Talwar et al., 2019) which refers to one's ability to maintain a good consistency between initial and subsequent statements to be credible (Evans & Lee, 2011; Talwar & Lee, 2002, 2008). Children's ability to maintain their lies is not always guaranteed, younger children having difficulties maintaining their initial denials if questioned (Talwar & Lee, 2008). The differences between these three levels of dishonesty rely on different cognitive sophistication (Alloway et al., 2015; Sai et al., 2021) and the motivation behind them. For instance, when cheating, children are mainly seeking to break a rule to gain an advantage; instead, when choosing to lie, they are trying to manipulate the other's behavior or beliefs to escape punishment (Zhao et al., 2021).

Regardless of the robust research examining the development of dishonest behaviors and their cognitive underpinnings, there is less work examining how social and contextual factors can contribute to dishonesty rates throughout childhood (Talwar & Crossman, 2011; Visu-Petra et al., 2022). Dishonesty represents an interpersonal exercise shaped by socio-environmental factors as well as cognitive ones (Talwar et al., 2017). Past research indicated that while the cognitive factors associated with children's dishonesty can shed light on how they succeed in deceiving others, social and contextual factors might tap into when children decide to act dishonestly or not (Talwar & Crossman, 2022). In the current study we focused on investigating both cognitive (e.g., advanced theory of mind), social (e.g., parental practices), and contextual (e.g., bilingualism and socioeconomic status) factors that can shed some light on the mechanisms behind cheating, lie-telling, and semantic leakage control in school-age children.

Understanding the developmental origins of deception could shed light on the nature of children's moral decision-making, informing interventions aimed at preventing the development of pervasive deceptive practices later on. By examining socio-cognitive and contextual factors associated with children's cheating, lie-telling, and semantic leakage control, we indirectly contribute to the design of honesty-promoting interventions focused on the "deep structure" of deception (Hertwig & Mazar, 2022). We address the process behind deception, the social figures that can promote honesty, and the contextual factors that can contribute to this reinforcement of honesty in children.

3.4.1.1 Children's Dishonesty and Cognitive Factors: Theory of Mind (ToM)

Using various versions of the TRP task, studies yielded mixed results regarding ToM's involvement in children's cheating, lying behaviors, and semantic leakage control. For example, previous research showed that different facets of ToM development predicted their respective usage in preschool years. More specifically, rudimentary forms of ToM predicted cheating behavior (e.g., knowledge access; Moldovan et al., 2020), while lie-telling and semantic leakage control were predicted by more advanced forms of ToM, such as first-order false belief understanding for lie-telling and second-order false belief understanding for semantic leakage control (Evans & Lee, 2011). Additionally, O'Connor and Evans (O'Connor & Evans, 2019) showed that preschoolers who scored higher on ToM tasks were less likely to cheat during a guessing game. At the same time, a growing body of evidence supports a positive relation between children's propensity and proficiency to lie in such games and their performance on first- and second-order ToM tasks (Lee & Imuta, 2021). Such findings could be explained by the perspective-shifting that ToM allows children to make. Using various versions of the TRP task, researchers have shown that concurrently with the development of first-order ToM, preschoolers' lies are better constructed, as they begin to understand that beliefs can be incorrect and that they have the power to instill false beliefs in others (Walczyk & Fargerson, 2019). Higher ToM could predict a reduction of transgressions because children become more aware that they may get caught. Nonetheless, if the transgression does occur, children's superior ToM skills can assist them in elaborating other lies to conceal this act (i.e., semantic leakage control). Research to date shows that semantic leakage control is related to second-order ToM (Polak & Harris, 1999; Talwar & Lee, 2002), which allows elementary school children to recursively think about beliefs (Wellman & Liu, 2004) and to progressively reason about complex relations between mental states. Based on second-order ToM inferences, children begin to carefully consider the concomitant expected values of truth and deceptive response options in a quasi-rational fashion, and thus, decide which kind of information to provide depending on the given circumstances (Walczyk & Fargerson, 2019).

Despite the breadth of research examining the relation between children's deceptive abilities and first-and second-order ToM, less is known about what happens when higher-order ToM developments occur. Even less is known about how more advanced ToM relates to children's transgressions. One of the most important post-preschool ToM developments is their understanding of interpretive diversity (Miller, 2012; Ross et al., 2005; Visu-Petra et al., 2022). Lalonde and Chandler (2002) defined the understanding of interpretive diversity as the ability to understand that a perceptively ambiguous stimulus can be interpreted differently by multiple individuals, naming it interpretive ToM (ToMi), and developing a new task, the Droodle task, to measure it. The task involves the usage of ambiguous drawings which are showed to the children, asking them to decide what two naïve observers will think the drawings represent. On the other hand, Schwanenflugel and collab. (1996) proposed a closely related ability termed constructivist ToM (ToMc) as an understanding that "knowledge can be more or less certain, that feelings of uncertainty are important in evaluating information, that things can have multiple meanings" (p. 288). They developed The Constructivist Theory of Mind Interview to assess this ability through a number of scenarios depicting how our cognitive processes can change the way in which different persons perceive the same situation (Walczyk & Fargerson, 2019). In this study, we will use both tasks and refer to interpretive diversity understanding (IDU) as a more general ability that incorporates ToMi and ToMc.

To our knowledge, the literature linking IDU to children's deceptive abilities is almost non-existent. Only one theoretical contribution (Moldovan et al., 2020) suggested that higher ToM developments, such as ToMc, could be associated with children's dishonest behavior. When deciding if they should lie or not, ToMc might assist children in mentally projecting the deceptive contents suitable for each target (e.g., "I can tell my new classmate that I was sick but not to my teacher because she will ask my mom about this, who knows I'm lying"). Anticipating multiple possibilities for various individuals can allow them to make better-informed decisions about lying or not. In addition, when constructing a lie, ToMc could support children's reasoning about how their deceptive statements will be peceived by the recipient (e.g., “How will this person react if I say that I know the correct answer to the hard question from TV?”). This is in line with Walczyk’s and Fargerson’s (2019) prediction that children are learning more effective ways to reduce the cognitive load associated with deception with increasing age. ToMc also allows the understanding of how a piece of information can be interpreted differently but yet accepted by multiple people (e.g., “Both my colleague and the teacher would believe that I was skipping school because I was practicing for an important contest”). When it comes to semantic leakage control, ToMc could help the child flexibly adjust a lie’s content to make it credible for different recipients. However, none of these relations were tested before in a comprehensive empirical study, and there is no information on how IDU could assist children’s cheating strategies.

3.4.1.2. Children’s Dishonesty, Parental, and Contextual Factors

3.4.1.2.1. Parental Rearing Practices

Parental rearing practices are linked to significant milestones in child development by defining many of their interactions with the environment (Bornstein, 2017). Unfortunately, existing research linking children’s cheating and lying to parenting behaviors yielded inconsistent results. The scarce research focusing on cheating behavior in older samples shows that college students were more likely to cheat when they perceived their mother as less affectionate and nonequalitarian (Kelly & Worell, 1978). The authors posited that this might be because they were less likely to develop socially acceptable behavioral alternatives throughout childhood due to this aversive socialization environment. Moreover, in academic contexts, past research demonstrated that students who experienced harsh parental disciplinary practices engaged in higher levels of academic dishonesty, such as cheating (Qualls, 2014). Instead, more recent research on preschoolers found no association between children’s cheating and parental behaviors (Kotaman, 2017). However, the contrasting results may be due to the differences in measuring parental rearing behaviors; while Kelly and Worell (1978) reported students' perception of parental behaviors, Kotaman (2017) evaluated parents' reports upon their childrearing behaviors.

Parents are an essential agent in children's developmental trajectories of lie-telling through their nurturing and socializing behaviors (Tong & Talwar, 2021). According to the domain of socialization framework proposed by Grusec and Davidov (2010), socialization takes place across several domains and includes approaches such as guided learning, group participation, control, protection, and reciprocity, through which parents are contributing to their children's socialization of honesty and to the development of socially accepted behaviors (Ma et al., 2015; Talwar et al., 2021; Tong & Talwar, 2021). Guided learning and group participation can contribute to children's ability to differentiate between truth and lies and choose accordingly. Instead, control is the most intensively studied parental aspect in relation to children's dishonesty, suggesting a strong positive association between controlling parental practices and actual lie-telling for self-serving purposes (Bureau & Mageau, 2014; Ma et al., 2015; Malloy et al., 2019; Waller et al., 2012). In support of this theoretical framework, a recent review of 13 studies argues that lying was associated with parent-child relationships characterized by low warmth and lack of communication (Eguaras & Erostarbe, 2021). In addition, Baudat and collab. (2020) found that parental support for autonomy was related to lower lying. Similarly, Stouthamer-Loeber and Loeber (1986) found that a low level of parental supervision and discipline was related to higher levels of deception. These results are consistent with Cumsille and collab (2010) findings on the lack of warmth in parent-child relationships and lying behavior.

3.4.1.2.2. Socioeconomic Status

Lower socioeconomic status (SES) is thought to have numerous detrimental effects, affecting children's cognitive and language development, social functioning, and mental health (Letourneau et al., 2013). Specific research on the association between SES and deceptive behavior yielded mixed results (Talwar & Crossman, 2011). On the one hand, several studies indicated that lower SES predicts increased deception in children (Achenbach & Edelbrock, 1981; Thijssen et al., 2017). On the other hand, other research found no difference in children's lie-telling behavior between lower and higher socioeconomic groups (Stouthamer-Loeber & Loeber, 1986). However, to date, no research has focused on the deception sophistication in relation to children's SES, despite the implications for their ability to successfully deceive.

3.4.1.2.3. Bilingualism

Being broadly regarded as one's ability to use two languages in everyday contexts (Grosjean, 2010), it is difficult to provide a definitive definition of bilingualism and second-language acquisition (Lynch, 2017). Given the current migration patterns and socioeconomic changes around the world, it has become more common for children to learn a second language from a young age. Thus, both research and educational policy makers are interested in how this process impacts children's socio-cognitive development (Bialystok & Craik, 2022; Fibla et al., 2022). One way of accommodating a second language is through bilingual education (Baker, 2007). For instance, immersive bilingual education implies that children speaking one language at home learn their school subjects in a second language (Baker, 2007). Throughout this paper, we will refer to this type of bilingual acquisition experience since our bilingual participants were enrolled in classes taught in a different language than the national language.

Undoubtedly, bilingualism influences many aspects of children's lives. Still, the debate regarding a definitive 'bilingual advantage' in cognitive domains such as theory of mind or executive functioning is ongoing (De Bruin et al., 2021; Schroeder, 2018; Yu et al., 2021). The relation between ToM and bilingualism represents an important research topic of the last decades, focused on what could enable bilinguals to outperform their monolingual counterparts on ToM tasks. Goetz (2003) suggested that better developed executive functions and metalinguistic abilities, as well as an increased understanding of the linguistic needs of their conversation partner could enable bilinguals to better solve these tasks. With respect to lie-telling, the pioneering research investigating the relationship between bilingualism and deception is scarce and exclusively focused on the adult population, showing that using a second language can decrease the ability to accurately differentiate between truthful and deceitful statements (Suchotzki & Gamer, 2018). On the one hand, this could be explained by the fact that, speaking in a foreign language regardless of the truthfulness of the conveyed message, requires more cognitive resources, which can be observed in comparable response times in both truthful and deceitful statements (Suchotzki & Gamer, 2018). On the other hand, the 'emotional distance' hypothesis argues that people can find it easier to lie in another language, since they can to some extent separate from the emotional valence of the message (Duñabeitia & Costa, 2015). To our knowledge, no study with children has addressed how bilingual children perform in peeking and lying tasks compared to monolinguals. We could anticipate a better performance considering their better ToM (Kovács, 2009) and executive functions (Costa et al., 2008), which were documented to positively support lie-telling behavior and its complexity.

3.4.1.3. Relations between the Variables

In light of the theoretical framework proposed by Talwar and Crossman (Talwar & Crossman, 2011, 2022) regarding the importance of contextual and cognitive factors in children's dishonest behaviors, in the current investigation we decided to zoom in on certain cognitive and contextual factors and discuss their interplay during middle childhood.

It is well established that school-age children's increasing ability to deceive is sustained by their superior cognitive functioning (Talwar & Crossman, 2011). Past research has widely investigated processes such as ToM or executive functioning as being related to different levels of sophistication in children's lies (Sai et al., 2021). In particular, advanced forms of ToM, such as IDU, are believed to be involved in every step of producing a lie (e.g., decision, activation, construction, action; Hertwig & Mazar, 2022; Walczyk & Fargerson, 2019). However, there is no empirical evidence on how IDU assists children in their deceptive behavior, from less sophisticated acts, such as cheating, to more complex ones, such as semantic leakage control.

In spite of the influence of cognition upon deception, it is also well established that children's social experiences and environmental factors can affect their honesty-related behavior, too (Heyman et al., 2019). Therefore, factors such as parental practices or socioeconomic status (SES) were also investigated in relation to children's deception. For instance, previous research demonstrated that adolescents who perceive their parents as controlling may use deception to gain autonomy (Bureau & Mageau, 2014) or to deal with unfair restrictions on personal activities imposed by parents (Perkins & Turiel, 2007). Additionally, adolescents who perceive their parents as controlling may be less likely to internalize the value of honesty (Bureau & Mageau, 2014).

With regard to SES influence on children's deception, results are mixed and mainly focused on the reported frequency of children's acts of dishonesty (Achenbach & Edelbrock, 1981;

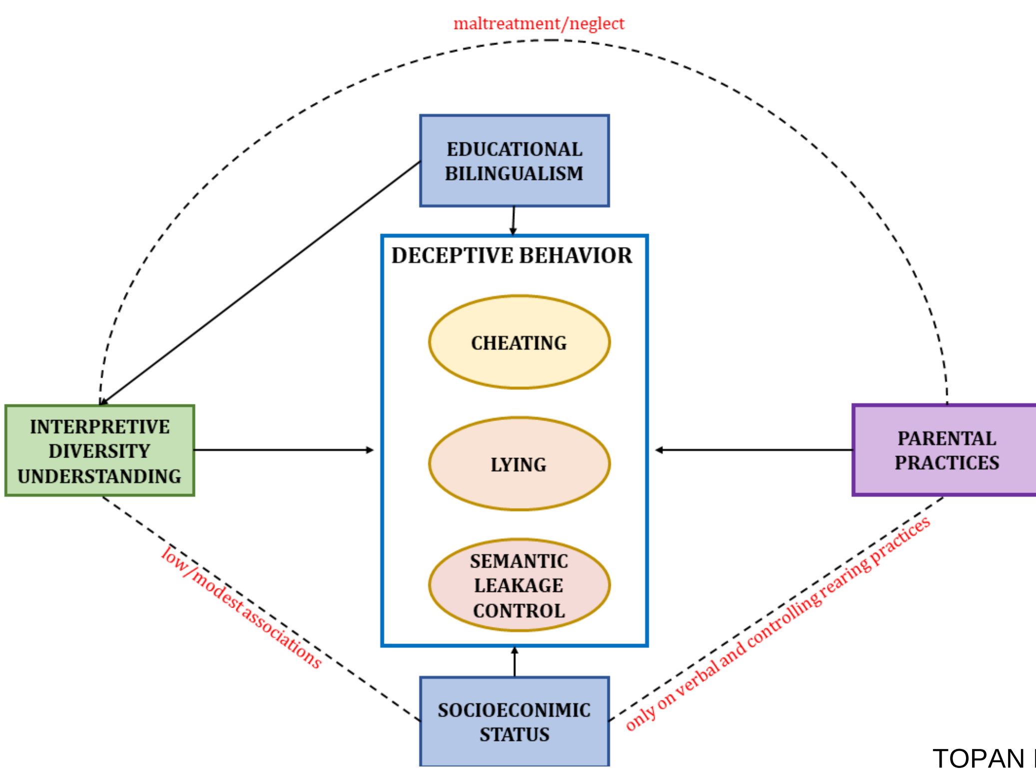
Stouthamer-Loeber & Loeber 1986). One possible explanation could be the indirect effect of SES on other predictors of children's social development, such as parental practices. Looking at the relation between SES and parental practices, Hoff et al. (2002) concluded that some aspects of parenting appear to be more susceptible to the influence of SES than others. A significant component of the SES-related differences in parenting can be attributed to parents' styles of verbal interaction. In comparison, SES-related differences in nonverbal interaction are fewer. For example, a pervasive difference is the tendency of lower-SES parents to be more controlling and punitive than higher-SES parents (Hoff et al., 2002).

Further evidence suggests that children's advanced ToM developments (i.e., IDU) are less susceptible to the influence of parental practices and SES. For example, O'Reilly and Peterson (2014) showed that school-age children's first- and second-order false belief understanding were insignificantly associated with usual parental measures (e.g., control, rejection, warmth). Additionally, Tafreshi and Racine (2016) reported the lack of association between children's interpretive ToM (ToMi) and parental reports of permissiveness or authoritativeness. Likewise, very small associations were also reported in a recent study regarding parental warmth and rejection in relation to ToMi and ToMc (Moldovan et al., 2022). Concluding on this matter, Foley and Hughes (2021) posited that normative variations in parent-child relationships are not very important for children's development of advanced ToM. Instead, significant differences are present in instances of parental neglect and maltreatment, which are off the normative chart. The same authors pinpoint a low to modest association between normative SES variability and individual differences in ToM during school age. In turn, we have very recent longitudinal evidence that for children living in poverty, the development of affective ToM is more salient (Huang et al., 2022).

Within the European educational context and due to the current political context, which leads to the influx of migrants and new policies worldwide, another increasingly important social factor that could shape children's ability to deceive is bilingualism. To our knowledge, the only empirical evidence on the association between deception and bilingualism comes from adult samples and suggests that bilingualism facilitates dishonesty due to lower emotional arousal when lying in a foreign language (Caldwell-Harris & Ayçiçe˘gi-Dinn, 2009). Another indirect path through which bilingualism can impact children's deception is ToM. Past research documented higher levels of ToM performance in bilingual children than in monolingual ones (Kovács, 2009) (see Figure 3.4.1 for the graphic representation of these relations).

Figure 3.4.1.

The Relations Between the Variables of the Study 4



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4.3.1.4. The Current Study

We investigated the associations between various socio-cognitive, parental, and contextual factors and school-age children's cheating, lying behavior, and semantic leakage control. First, we wanted to explore the relation between children's cheating, lie-telling, and semantic leakage control and their interpretive diversity understanding (IDU). To the best of our knowledge, this relation has not yet been directly addressed (Moldovan et al., 2020). Given this aim, we chose to study children between 9 and 11 years old because, according to previous literature on children's understanding of mental processes, they come to understand specific mental activities gradually. For example, Lovett and Pillow (1995) showed that for children is easier to understand the process of memorization before the one of comprehension, and that this understanding starts from the age of 8 and progresses intensively soon after this emergence point (Weimer et al., 2017). Consequently, we developed a new version of the TRP task to simultaneously evaluate children's cheating, lie-telling, semantic leakage control and IDU, aiming to explore their interrelation. Although there is no previous empirical evidence on the relation between IDU and children's deceptive behavior, based on previous theoretical arguments discussed before (Moldovan et al., 2020), we anticipated children's dishonest behavior (including cheating, lie-telling, and semantic leakage control) would be positively associated with IDU.

The relation between children's dishonesty and bilingualism was also explored. In that respect, we were interested in testing the direct and indirect effect of bilingualism on children's dishonesty. Besides its' direct effect, given previous literature indicating that bilingualism is associated with higher ToM performances in children (Kovács, 2009), we anticipated a mediation effect of IDU on the relation between bilingualism and children's dishonest behavior (cheating, lying, and semantic leakage control).

Additionally, we hypothesized that children's cheating and lying behavior would be negatively associated with socioeconomic status (SES) (Thijssen et al., 2017), so that children with higher SES will be less likely to cheat and to lie about doing so, while those with lower SES have multiple motivations for covering their misdeeds and dishonesty. Children's cheating and lie-telling were expected to be positively associated with parental rejection and overprotective rearing practices (Bureau & Mageau, 2014; Stouthamer-Loeber & Loeber, 1986). We also explored the relation between children's semantic leakage control and parental practices such as parental rejection and overprotection. Lastly, considering the previous literature demonstrating the importance of SES on certain parental practices (Hoff et al., 2002) (e.g., parental verbal interactions style), we also wanted to explore the mediation effects of parental rearing practices (e.g., emotional warmth, rejection, and overprotection) on the relation between SES (income, parental education) and children's dishonesty (cheating, lie-telling, and semantic leakage control).

3.4.2. Methods

The current investigation represents a cross-sectional correlational study in which we used a behavioral task in order to evaluate children's cheating, lie-telling, and semantic leakage control.

3.4.2.1. Participants

Participants were recruited from different schools upon invitation to participate based on the institutional collaboration protocols and parental informed consent. We targeted schools from different urban parts of the country and selected them based on their availability and willingness to be involved in the project. From those schools, we invited all children between 9 and 11 years to participate. Consequently, only certain classes from each school were involved (e.g., classes from the 3rd and 4th grades). Informed consent was asked from children's caregivers, but their involvement was voluntary (children and their parents were not renumerated). We received informed parental consent for a sample of 196 children, ages 9- to 11-years old (Mage = 124.18 months, SD = 7.25; 106 girls). In all, 113 were enrolled in monolingual schools from Northeast Romania, whereas the other 83 children attended a bilingual German- Romanian school program where they spoke German. Children's verbal assent to participate in this study was obtained before their involvement in the testing sessions. Children who did not have written parental consent were not included in the present study.

3.4.2.2. Measures

Cheating, Lie-Telling, and Semantic Leakage Control

The Preference Task, a modified version of the Trivia Game (Talwar & Lee, 2008), was developed to elicit children's cheating, lie-telling behaviors, and semantic leakage control while requiring different IDU levels (low versus high). The game contained five trivia questions and was presented in an E-Prime slide show. Each slide showed a question with three possible answers. The correct answer was displayed on the following slide. Children were told that for some of the questions, they would be asked to come up with plausible explanations for the given answer to win the game and obtain a desirable prize. The game could be played by pressing a key for going forward and another key for going backward through the slides. At first, the experimenter demonstrated this and then asked the child to navigate through the game by themselves.

The game started with two "control" questions meant to accommodate children with the game's rules. These were considered control questions due to their low level of complexity, simply asking children for easy answers known as common knowledge (e.g., the capital of their country). Moreover, in terms of IDU requirements, the first three questions did not elicit high IDU levels (Q1, Q2, and Q3; e.g., Q1: Which of the following is the capital city of Romania? a. Bacau, b.

Timisoara, c. Bucharest), while the last two required reasoning about different perspectives (Q4 and Q5; e.g., Q4: A group of children and their parents were asked by researchers which of the following animals was the loveliest to have? a. Koala, b. Dog, c. Duck).

For the two questions that required high levels of IDU (Q4 and Q5), children were asked to answer by considering the perspective of two groups (children and their parents) and explaining each answer. Participants were told that, even though children and their parents had the same answer to the question, they did not always have the same reason for choosing it, thus tapping into understanding multiple perspectives of different targets. Q4 was designed as another “control” question, as it had an easy-to-know answer. However, in order to motivate their answer from two different perspectives, children had to minimally employ their interpretative reasoning when considering that parents’ responses might differ from children’s. This was meant as an IDU practicing question to prime participants on how to answer the last question, which was an “impossible to answer” question in the absence of cheating demands (Q5: A group of children and their parents were asked by researchers about what kind of music they think is the most fascinating? with the possible answers being a. Agrotech, b. Folktronica, c. Neurofunk).

To elicit cheating and lying, two of the questions were made up, so they were considered impossible to respond to without peeking at the correct answer because there was not a real correct answer to them (Q3 and Q5; e.g., Q3: Who discovered Tunisia? a. Alexander the Great, b. Vasco da Gama, c. Profidius Aikman). For these two questions, before the child answered each question, the experimenter excused themselves and left the room for 3 min, saying that they must take an important phone call, thus creating the opportunity for the child to cheat. If the child peeked by moving on to the slide in the experimenter’s absence, they would find an impossible-to-know answer on the slide. Upon return, the confederate asked the child if they peeked at the correct answer, and then the child was invited to give their answer to the respective question (i.e., to Q3 or Q5) (Talwar & Lee, 2008).

Subsequently, we had one deceptive question with low IDU level requirements (Q3) and another one eliciting high IDU levels (Q5). For Q5, if the child transgressed by moving on to the next slide in the experimenter's absence, they would find an impossible-to-know answer on the slide along with the justifications for the children's and their parents' answer (e.g., The correct answer is: b. Folktronica; Explanations: Children: Folktronica is the most fascinating because it is easy to dance to; Parents: Folktronica is the most fascinating one because it combines multiple genres). Those who transgressed and denied their action had to generate different plausible justifications from those found in the following slide to be credible and win the game. After giving their answers, participants were shown the last slide containing the correct answer and the justifications given by children and parents (see Figure 3.5.2. for a summary of the task).

Figure 3.4.2.

The Preference Task Questions and Their Requirements to Know the Correct Answer to Each of Them

No.	Trivia question	Cheating	Lying	Semantic leakage control	IDU
Q1 – control question	Which of the following is the capital city of Romania? a. Bacau b. Timisoara **c. Bucharest**				
Q2 – control question	A group of children and their parents were asked by researchers which of the following animals was the most intelligent? a. Cockroach **b. Monkey** c. Goose				
Q3 – deceptive question	Who discovered Tunisia? a. Vasco da Gama b. Edward Bipley **c. Profidius Aikman**	✖	✖		
Q4 – control question with IDU	A group of children and their parents were asked by researchers which of the following animals was the loveliest to have? a. Koala **b. Dog** c. Duck Explanations for children? Explanations for parents?				✖
Q5 – deceptive question with IDU	A group of children and their parents were asked by researchers about what kind of music do they think is the most fascinating? a. Agrotech **b. Folktronica** c. Neurofunk Explanations for children? Explanations for parents?	✖	✖	✖	✖

Children's peeking behavior on the two deceptive questions was recorded by registering the keys pressed by children in the experimenter's absence in the E-prime task. The adequacy of this new version of the task was initially piloted on an initial sample of 20 children, which led to various task refinements. Based on their behavior, children's actions during the experimenter's absence were scored as 2 if the child peeked on both occasions, 1 if they peeked only once, or 0 if they did not peek at all. Likewise, children's lie-telling behavior was scored as 2 if they lied about peeking on both occasions, 1 if they lied about peeking only once, or 0 if they did not lie at all. Also, a distinct score was obtained based on children's given justifications for Q5 (dishonesty and IDU eliciting) and used as a proxy for semantic leakage control. We considered this score an indicator of children's semantic leakage control because, in order to maintain the initial denial of peeking, children must be able to feign ignorance by giving different explanations than those presented to them on the slide. Children's justifications were coded according to their match to those written on the last slide of the game (2 = entirely distinct explanations, e.g., Children chose Folktronica because they listen to it in school. Parents chose Folktronica because it reminds them of their youth; 1 = partially distinct justifications, e.g., Children chose Folktronica because they often dance to it. Parents chose Folktronica because it reminds them of their youth; 0 = identical explanations to those on the slides).

Interpretive Diversity Understanding (IDU)

Droodle Task. Children's IDU was assessed using the Droodle Task (Lalonde & Chandler, 2002), which taps into children's ability to understand that people exposed to the same stimuli can construct diverse interpretations due to their previous beliefs, attitudes, and knowledge (ToMi) (Carpendale & Chandler, 1996; Pillow & Mash, 1998). First, children were shown a picture representing the first Droodle (e.g., an elephant and an orange) and asked to describe it. Then, the confederate fitted the drawing into an envelope into which a small viewing window was cut. This way, it masked most of the extended picture, exposing only a part of the drawing which was ambiguous (e.g., the trunk of the elephant and a part of the orange). Next, children were introduced to two dolls who did not see the drawing beforehand. After that, children were asked to infer the interpretation of each doll upon the identity of the full drawing based on the ambiguous keyhole view, thus requiring them to ignore the information they had about the true identity of the drawing and to imagine two new interpretations that the dolls might have. A second trial immediately followed with a different picture.

The participants' responses to each Droodle were coded according to the following criteria: (a) the similarity of children's response with the original picture (1 = no similarity, 0 = obvious connection to the picture) and (b) the similarity between the attributions for the two dolls (1 = no similarity between the dolls' descriptions, 0 = similar descriptions).

The Constructivist Theory of Mind Interview. Another independent measure of IDU was The Constructivist Theory of Mind Interview (Weimer et al., 2017), which was meant to assess children's capacity to reason about how a person is making sense of a situation depending on the mental processes involved and how children understand the inner workings of these processes (ToMc). The questionnaire contained 10 scenarios confronting one or two persons with visual, auditory, or verbal stimuli. Children were asked about the person(s)' mental processes regarding those stimuli, reflecting their IDU across six different cognitive processes: Memory, Attention, Comprehension, Comparison, Planning, and Inference. Memory entails individual differences in how people remember things that happened or not (e.g., Could two people watch the same thing happen and both see and hear everything but remember it very differently?). Attention involves one's ability to reflect on how people can operate with visual or auditory stimuli and make sense of them (e.g., Can somebody look at something but not see it?). The Comprehension scenarios question whether people can form a clear mental representation of a given material based on previous knowledge or current disposition (e.g., Could somebody remember everything someone said to them but not understand it?). Comparison involves contrasting different aspects of information from the world, whereas Planning involves anticipating action in relation to a predetermined goal. Finally, Inference refers to one's ability to understand that people can come up with a conclusion regarding a situation based on different reasoning processes.

The responses were coded as “Yes, with Active mental Process Explanation” (scored as 2; e.g., Yes, if one sees things positively, one negatively) if children’s responses referred to the inherent differences of mental processes across individuals. However, if children made references to perceptual stimuli properties or knowledge differences between individuals, such as poor quality of perceptual information (e.g., Yes, if one didn’t pay attention), or if their response was Yes, but failed to explain (e.g., Yes, but I don’t know how), their responses were coded as “Yes, with Non-Active Mental Process Explanation” (scored as 1). Lastly, children’s lack of response or “I don’t know” answers were scored as 0. Six different ToMc scores corresponding to each mental process were calculated.

Parental Rearing Practices

Children’s perception of their parents’ behaviors was assessed using the Romanian version of EMBU – A (Paloș & Drobot, 2010), an adaptation of the EMBU (Perris et al., 1980). The EMBU version used in the present study contained 49 items corresponding to Emotional Warmth (e.g., *Do you feel that your father/mother minds helping you if you have difficulties with something?*), Rejection (e.g., *Does your father/mother punish you for little things?*), and Overprotection (e.g., *Do you have to tell your father/mother what you’ve been doing when you get home?*) factors. The questions were answered on a 4-point Likert scale indicating the frequency to which parents were displaying those behaviors. Children first assessed the mother and then the father’s rearing behaviors with two identical questionnaires. A composite score was calculated for each EMBU factor by obtaining the average between children’s reported scores for mothers and fathers.

Bilingualism

Immersive bilingual education was used as a proxy for bilingualism assessment. In the current study, we included children who were attending monolingual (n = 113) and dual-language (n = 83) school programs. According to this criterion and the sociodemographic information offered by parents regarding the number of languages spoken at home, we qualified participants as monolingual or bilingual. For the monolingual group, we only included children who spoke only the maternal language at home and at school, and who were not attending any intensive language courses outside of school. For the bilingual participants, we recruited children who were speaking German at school (the school subjects were taught in German), but a different language at home (e.g., Romanian, Hungarian).

Socioeconomic Status

Besides basic sociodemographic information and languages spoken at home, parents completed a demographic questionnaire containing information about their income and their highest education level achieved. Household income was assessed using a 5-point Likert scale indicating different levels of household incomes (1 = below 300 RON, 2 = between 400 and 500 RON, 3 = between 500 and 1000 RON, 4 = between 1000 and 2000 RON, and 5 = above 2000 RON). Parental education (mothers' and fathers') was evaluated on a 9-point nominal scale containing the formal education options available in Romania (1 = Primary School, 2 = Secondary School, 3 = Professional School, 4 = Pedagogical Highschool, 5 = Theoretical Highschool, 6 = Post-secondary School, 7 = Bachelor Degree, 8 = Master's Degree, and 9 = Doctoral Degree). Parents had to choose one of the 9 possible options depending on the last formal education level graduated.

3.4.2.3. Procedure

At first, we obtained parental written consent for children's involvement in the study. Before obtaining parental consent, parents received brief information about what we were interested in investigating in the current study. They also had to complete a questionnaire regarding demographical information. Next, children with parental consent were asked for verbal assent and then completed the parental practices questionnaire in a classroom setting with the teacher's permission. Next, every child went through an individual testing session in which the Droodle Task, Preference Task, and Constructivist Theory of Mind Interview were administered. The whole session lasted for about 40 minutes for every child. For bilingual children, all the tasks were administered in German by a trained research assistant. As for monolingual children, the testing sessions were administered in Romanian. At the end of the session, participants went through a short debriefing session about the game, and all of them received a small reward (as promised in the deceptive game's scenario). All the testing sessions took place in children's schools with the teachers' permission.

3.4.3. Results

First, descriptive statistics were computed (see Table 3.4.1). Second, because very few children peeked just once at the correct answers in the dishonesty task (n = 24), children who peeked once and those who peeked twice were collapsed in one category representing children who cheated at least once (see Table 3.4.2 for frequencies). Three binomial logistic regression were employed to test the influence of socio-cognitive factors on children's cheating, lie-telling, and semantic leakage control. To test for all the indirect effects, we performed mediation analyses using PROCESS (model 4). Lastly, we address the possibility of multicollinearity in our data by computing bivariate correlations (see Appendix D). The correlations revealed modest associations between our independent variables which informed us that no multicollinearity was present.

Table 3.4.1. *Descriptive Statistics for Parental and Cognitive Measures*

	Range	**M**	**SD**
Interpretive diversity Droodle task	0 - 2	1.60	0.68
Interpretive diversity ToMc Attention	0 - 6	2.21	1.59
Interpretive diversity ToMc Comparison	0 - 2	1.35	0.86
Interpretive diversity ToMc Comprehension	0 - 4	2.18	1.09
Interpretive diversity ToMc Inference	0 - 2	1.04	0.90
Interpretive diversity ToMc Memory	0 - 4	2.89	1.15
Interpretive diversity ToMc Planning	0 - 2	1.49	0.73
Parental Emotional Warmth	0 - 66	34.46	7.30
Parental Overprotection	0 - 37	13.09	4.69
Parental Rejection	0 - 38	12.23	4.58

Table 3.4.2. *Peeking, Lie-Telling Behavior, and Semantic Leakage Control Frequencies*

Peeking behavior (N=196)			Lie-telling behavior (N=80)			Semantic leakage control - SLC (N = 68)		
No peeking	Peeking once	Peeking twice	No lying	Lying once	Lying twice	No SLC	SLC once	SLC twice
59.2%	12.2%	28.6%	15%	23.8%	61.3%	41.2%	8%	50%

A preliminary analysis explored the effects of gender. However, no main gender effects were obtained, and thus it was no longer included in the following analysis. For SES, descriptive statistics showed that 50% of the parents reported household incomes above 2000 RON. In contrast, another 25% reported revenues between 1000 and 2000 RON. This informs us that our sample comes from rather low- and middle-income families, given that the average household income in Romania is above 3500 RON (National Institute of Statistics, 2021). In terms of parental education, data showed that approximately 40% of the parents had a Bachelor's degree, and 12% had a Master's Degree.

3.4.3.1. Children's Peeking Behavior

Out of 196 participants, 80 (40.8%) peeked at least once at the "impossible" answers of the game. To test the effects of demographics, cognitive, parental, and contextual factors upon children's propensity to peek, a binomial logistic regression was employed. Age, SES (income and parental education), IDU scores (ToMi and ToMc scores), bilingualism, and parental rearing practices were entered in the analysis as main effects. The overall model was significant, χ^2 = 106.38, Nagelkerke R^2 = .58, p = .000, indicating that income (b = 0.25, Wald = 12.54, p = .001, OR = 2.64), parental rejection (b = 0.14, Wald = 5.66, p = .017, OR = 1.14), and ToMc Comparison (b = 0.19, Wald = 10.24, p = .001, OR = 2.53) positively predicted children's propensity to peek at least once.

Since the direct effect of bilingualism on children's cheating behavior was not statistically significant, we did not perform the meditation analysis of IDU on the relation between cheating and bilingualism.

Lastly, given the significant effects of income and parental rejection on children's peeking behavior, we employed a mediation analysis to test for the indirect effect of income on peeking behavior as a function of parental rejection. Results showed that the indirect effect of parental rejection on peeking behavior was significant (b = .0537, CI 95% [0.004; 0.187]), while the direct effect of income on peeking behavior remained significant (b = 0.943, z = 4.861, p = .000, CI 95% [0.563; 1.323]).

3.4.3.2. Children's Lying Behavior

Among children who peeked at least once (n = 80), 68 (85%) of them lied about doing so. Similar to peeking behavior, because fewer children decided to lie only once (24%), children who lied once and those who lied twice were collapsed in one category representing children who lied at least once. To test the effects of demographics, cognitive, parental, and contextual factors upon children's lie-telling behavior, a binomial logistic regression was employed. Age, SES (income and parental education), ToMc scores, bilingualism, and parental rearing practices were entered in the analysis as main effects. The overall model was significant, $\chi^2 = 44.81$, Nagelkerke $R^2 = .76$, $p = .000$, indicating that maternal education ($b = 0.347$, Wald = 5.08, $p = .023$, OR = 5.11) was positively associated with children's decision to lie. ToMc Comprehension (b = -0.391, Wald = 4.72, $p = .030$, OR = 0.08) and ToMc Memory ($b = 0.520$, Wald = 5.20, $p = .023$, OR = 36.84) scores were also significant predictors of this decision. The ToMc Comprehension score was a negative predictor, being related to a lower propensity for children's lie-telling behavior, whereas the ToMc Memory score was a positive predictor. With regard to contextual factors, bilingualism ($b = 0.429$, Wald = 4.25, $p = .039$, OR = 1031.31) and parental rejection ($b = 0.842$, Wald = 3.22, $p = .043$, OR = 3.09) positively predicted participants' decision to lie.

Given that the bilingualism effect was significant, a simple mediation analysis was performed in order to account for a possible indirect effect of IDU on the relation between bilingualism and children's lie-telling behavior. The results showed that the indirect effect of ToM Comprehension on lie-telling was significant ($b = .562$, CI 95% [0.018; 1.550]), whereas the direct effect of bilingualism on lie-telling was insignificant ($b = 1.276$, z = 1.835, $p = .065$, CI 95% [-.086; 2.640]).

We also tested the mediation effect of parental rejection on the relation between maternal education and children's lying behavior, but the analysis yielded insignificant results (*b* = 0.055, CI 95% [-.122; .636] for the indirect effect). The direct effect of maternal education remained significant (*b* = 0.423, z = 1.994, *p* = .046, CI 95% [.007; .839]).

3.4.3.3. Children's Semantic Leakage Control

Within the sample of children who denied their transgressions (n = 68), a binomial logistic regression was employed to determine the predictors for children's semantic leakage control. Because very few children partially controlled their semantic leakage control (n = 6), they were collapsed with children who fully controlled their semantic leakage, resulting in the category of children who controlled their semantic leakage at least once. Age, SES (income and parental education), IDU scores (ToMi and ToMc scores), bilingualism, and parental rearing practices scores were introduced as main effects and the overall model was significant χ^2 = 32.05, Nagelkerke R^2 = 0.52, *p* = .006. When looking at factors that significantly contributed to children's semantic leakage control, results indicated that only the ToMc Planning score (*b* = 0.34, Wald = 6.73, *p* = 0.009, OR = 8.63) was a positive predictor.

The mediation effects of IDU and parental rearing practices on the relation between bilingualism, SES, and semantic leakage control were not tested because the binomial regression yielded insignificant associations between semantic leakage control and these two predictors.

3.4.4. Discussion

In the current study we examined the cognitive, parental, and contextual predictors involved in school-age children's cheating, lie-telling behavior, and semantic leakage control. For the first time in the literature, we intersected two facets of advanced ToM (ToMi and ToMc) with children's dishonesty by investigating them as interpretive diversity understanding (IDU). Our main findings showed that children's decision to peek was positively related to their ability to understand the active nature of mental comparison (ToMc Comparison) and to some parental and contextual factors, such as parental rejection and income. Also, children's decision to lie was associated with individual differences in ToMc Memory and ToMc Comprehension understanding and with contextual and parental factors such as higher maternal education, parental rejection, and bilingualism. Lastly, their subsequent ability to maintain the lie (i.e., semantic leakage control) was positively related to their capacity to understand the active nature of a decision-making process that implies planning (ToMc).

3.4.4.1. The Decision to Peek

Our results revealed that only 40% of the children peeked at the correct answers at least once. This represents a lower proportion than previous research reporting higher percentages (over 60%) for children's propensity to peek (Talwar & Lee, 2008). However, according to Carl and Bussey (2019), a smaller number of transgressions might have resulted in our scenario due to the specific nature of the deceptive task. Specifically, the authors posited a change in children's behavior based on fundamental differences in the deceptive context created (cheating on a game versus cheating on a test), with fewer children cheating when the task was presented as a knowledge test rather than a guessing game. Our task was advertised as a game, but its design resembled a knowledge test. Moreover, the testing session took place in the participants' schools. Hence, children may have perceived it as a more formal activity. As such, peeking in this context might have been regarded as frowned upon, given the moral standards imposed by such institution, resulting in fewer peekers. In order to better understand the influence that the testing environment has on children's cheating, future research may compare children's cheating behavior tested in schools to others tested in a more neutral setting.

In accordance with the current study's first hypothesis, we showed that children's cheating behavior was significantly associated with their IDU performance. More specifically, our findings suggest that children who decided to peek had higher ToMc Comparison scores. According to Schwanenflugel and colleagues (1994), the mental activity of comparison involves contrasting different aspects of information from the physical world and interpreting things differently based on one's knowledge and experience. Perhaps understanding that people's perceptions of the same thing can differ depending on their capacity to sample and contrast information made children more prone to peek at the correct answers. More specifically, this ability could assist them in anticipating that the experimenter could make sense of the peeking context via careful consideration of alternatives, comparing the information provided on the slides to those that a school-age child may possess. Thus, maybe children with better ToMc Comparison understanding predicted that the experimenter wouldn't find their knowledge suspicious and would assess their knowledge as possible compared to other children.

The intriguing positive association between SES and children's cheating was contrasting our initial hypothesis regarding the association between these two, but echoed past research. For example, Alan and collab. (2020) demonstrated that children from higher SES families cheated more in a creative task than those from lower SES families. In the current study, we must consider the effects of higher income on various aspects of children's lives. For instance, children from low-income families have less access to a computer at home. In addition, data show that even if they can afford a computer, low-income children tend to use it less than others (Becker, 2000). This is a crucial aspect due to the computerized nature of our deception game. Considering this, perhaps children from lower SES families were less familiar with computer use, which, in turn, could impact their performance in the game we played, making them more reluctant to manipulate the keys meant to be pressed in order to find out the correct answers to the impossible questions. Moreover, a growing body of evidence suggests that SES can have an important impact on specific parental practices (Bøe et al., 2014; Hoff & Laursen, 2019). Compared to higher SES families, parenting within low SES families has been documented to be harsher and more controlling across cultures (Hoffman, 2003). In the Romanian population, it was shown that parents from low-income families impose harsher discipline and controlling behaviors upon their children than those from middle-income families (Robila, 2004; Robila & Krishnakumar, 2006). This is also sustained by our results regarding the mediation effect of parental rejection on the relation between income level and children's cheating behavior. In the present context, it is possible that children with higher SES were more prone to peeking based on their willingness to break the game's rules, anticipating less punishment from their parents regarding the transgression (Robila, 2004).

Lastly, we also anticipated that children's cheating would be positively associated with parental rejection and overprotection. Our findings showed that children's reported parental rejection scores were positive predictors of their peeking behavior, which are supported by previous research showing that children's perceived levels of parental rejection represent a significant predictor of their externalizing behaviors (Buschgens et al., 2010; Maftei et al., 2020). With respect to cheating, previous research regarding the relation between students' perceptions of parental behaviors and cheating showed a positive association (Kelly & Worell, 1978). In this case, children's likelihood to peek could be facilitated by parental rejection, this kind of behavior being regarded as a way to escape parental influence or defy authority, which could also have an impact on other forms of dishonesty, such as academic cheating (Qualls, 2014). Moreover, this could also be explained by the studies showing that such parental behaviors are associated with cognitive deficits, such as poorer executive functions which could account for children's peeking behavior (i.e., lower levels of inhibition; Talwar et al., 2017).

3.4.4.2. The Decision to Lie

Following the first aim of the present study, we analyzed the association between children's lying behavior and interpretive diversity understanding (IDU). Our results showed that the ToMc Comprehension score negatively predicted children's lie-telling behavior, whereas the ToMc Memory score was a positive predictor of this decision. Previous research argues that children's ability to distinguish between the cognitive processes of memorization and comprehension develops gradually, studies indicating a rudimentary differentiation between them from the age of 8 and intensively progress after that (Lovett & Pillow, 1995; Weimer et al., 2017).

Past research shows that the criteria for achieving comprehension can be both psychological and behavioral. For example, if a person has to assemble a piece of furniture, the psychological marker of comprehension would be the sense of a clear and consistent representation of the meaning of the assembling instructions. As for the behavioral markers, that would be the execution of the instructions read on the paper (Lovett & Pillow, 1995). While its psychological features consist of having a clear mental representation or understanding the meaning of a particular situation, stimulus, or text, it was demonstrated that it is harder to define its behavioral markers, depending on the context of the activity (Lovett & Pillow, 1995). When referring to how children come to understand the mental process of comprehension, research showed that they are more likely to emphasize the external cues that can mediate it (Schwanenflugel et al., 1994). Transferring this reasoning to the deceptive context created in the current study, we can speculate that children made sense of the experimenter's comprehension process regarding their transgression based on the external contextual cues available. For instance, those children who identified the role of external cues in the experimenter's comprehension process subsequently decided not to lie (e.g., *The experimenter could easily find out if I peeked or not if they can check which keys I pressed while they were away*).

Regarding ToMc Memory, current findings showed that children's ability to consider the constructive nature of someone's remembering process positively predicts their lying behavior. In the present context, understanding that remembering (as depicted in the ToMc Interview's scenarios) is subjective, dependent on one's experience and interpretations could stimulate children's decision to deceive. From this point of view, understanding that memory is constructive or different across people can assist children in imagining that the experimenter could consider their ability to remember such difficult facts as varying from one child to the other, thus they wouldn't find their better performance suspicious. Moreover, IDU could assist children in mentally projecting multiple possibilities and contents depending on their assessment of how information could be remembered and considered by the recipient and made them feel more confident in their ability to lie to win the prize (Schwanenflugel et al., 1996; Weimer et al., 2021).

Our investigation also revealed that bilingual children were more likely to lie than monolinguals. Based on existing research, we can speculate several explanations for this finding. One promising perspective regards the "metalinguistic awareness," which refers to bilingual children's grasp of the fact that words are instrumental and their mental representation can vary from one person to the other (i.e., one object can have multiple linguistic labels). This ability is considered an underlying mechanism of an enhanced ToM, but more evidence is needed to directly support this claim (De Bruin et al., 2021; Schroeder, 2018). In the current study we provided preliminary evidence that would sustain this perspective, as ToMc Comprehension mediated the relation between bilingualism and children's lie-telling. Another perspective regards the "socio-pragmatic" aspect of bilingualism. Bilingual children learn from a very young age that not every person can speak the same language(s) as them; hence, they need to adapt their language to the other person's communicational needs. As such, both metalinguistic and socio-pragmatic accounts could contribute to a more nuanced ability to understand that people can hold different mental representations (Schroeder, 2018; Yu et al., 2021). Based on these findings, we suggest that bilinguals might be able to use their interpretive skills more easily than their monolingual counterparts within social interactions that might involve deception.

Another hypothesis of the current study was that lie-telling behavior would be negatively associated with SES. Although other studies examining the relation between SES and lie-telling behavior showed that children with lower SES lied more frequently (Achenbach & Edelbrock, 1981), the current study revealed a positive relation between these two, as children with highly educated mothers were more likely to lie. We also tested for the association between children's lie-telling and the other SES proxies included (e.g., income), but the results were not significant. Our significant finding regarding maternal education is consistent with other evidence suggesting that highly educated mothers tend to show more support and encourage children's autonomy, with less harsh and controlling rearing tendencies that would guide their actions (Hoff et al., 2002). Therefore, children with highly educated mothers could feel more confident in their right to obtain the desirable prize, knowing that they are granted more freedom and understanding from their parents. Nevertheless, our mediation analysis was insignificant, revealing no indirect effects of maternal education on children's lie-telling as a function of parental rejection. This might be because, in this age range, the SES-related differences in parental behaviors could be more evident for the controlling practices and not for the rejective ones (Hoff et al., 2002).

Lastly, in line with previous literature showing a positive relation between children's propensity to lie and parental rejection and controlling influences (Bureau & Mageau, 2014; Stouthamer-Loeber & Loeber, 1986), we predicted that participants who were more willing to lie would also report higher levels of parental overprotection and rejection. Our results showed that children who perceived higher levels of parental rejection decided to lie more. Also, this could be explained by previous research showing that children with dismissive mothers tended to lie more as a behavioral strategy that allowed them to avoid negative consequences associated with a transgression (Stouthamer-Loeber & Loeber, 1986). In time, this social strategy may become a pervasive one that children adopt when faced with an authoritative figure, trying to avert possible repercussions.

3.4.4.3. The Semantic Leakage Control

With regard to children's ability to maintain their initial denials, our study showed that children's ToMc Planning score positively predicted their semantic leakage control. Understanding the importance of planning in the generation process of a mental interpretation could have assisted them in planning their answers in the deceptive context depending on the recipient's perspective and interpretation of things. This allowed children to flexibly adjust their subsequently given explanations considering that others might interpret things differently. Moreover, the extensive line of research investigating the influence of executive functions upon children's lying sophistication has shown that children's planning abilities are helping them find the best strategies to maintain their lies, previous studies demonstrating better planning performances among lie-tellers than confessors (Evans & Lee, 2011; O'Connor et al., 2020).

However, there were no significant effects of parental rearing practices, bilingualism or SES on children's semantic leakage control. One explanation for the lack of significance could reside in the importance of cognitive factors for children's ability to tell sophisticated lies in middle childhood (i.e., semantic leakage control). If peeking and telling an initial lie is decision-based, sustaining the initial lie is less a matter of decision and more a matter of skill. According to some scholars (Moldovan et al., 2020; Walczyk & Fargerson, 2019), children's semantic leakage control could be strongly supported by their advanced cognitive development, such as ToMc, which allows them to flexibly adjust an initial lie by considering multiple scenarios and modifications for various targets across time. We also know from previous literature that ToM development in middle childhood and adolescence is not that susceptible to parental influences (O'Reilly & Peterson, 2014; Tafreshi & Racine, 2016) or normative SES variations (Foley & Hughes, 2021). These theoretical arguments are supported by present findings demonstrating that sematic leakage control was positively predicted only by ToMc processes (planning).

3.4.4.4. Limitations

Despite the notable findings of this research, we should also pinpoint its significant limitations. Our results showed that the proportion of peekers and non-peekers was approximatively equal (40% of children peeked at least once; Carl & Bussey, 2019). In spite of this high variability, we obtained significant results concerning the association between cheating and socio-cognitive factors in middle childhood. Nevertheless, in the subsequent analyses performed for children's lie-telling and semantic leakage control the data variability of the outcome was much lower (85%, and 60% of participants, respectively engaged in lie-telling and demonstrated semantic leakage control), which affected the possibility to highlight the predictive value of the socio-cognitive and contextual factors (Carl & Bussey, 2019). Second, the cross-sectional nature of the study does not capture the maturational effects in their IDU, with longitudinal studies such as Talwar and collab. (2019) being optimal for describing the dynamics between the socio-cognitive variables underpinning deceptive behavior.

We introduced a new version of the Trivia peeking game that more closely resembles actual testing scenarios by relying on a novel and less invasive method of recording cheating behavior. Despite the advantages of this experimental variation (ecological validity, no need to video record children as they cheat), it can induce supplemental individual confounds such as familiarity with computer use and test anxiety. Convergent validation of this novel procedure with the classical TRP paradigm is a fruitful future direction that should be pursued to ensure its validity.

The convenience sampling procedure that we used could also be an important limitation of the present study. Requiring written parental consent for the participants' involvement in the study, we could not ensure that every 9 to 11 years old child had the same chances of being a part of the study. We tried to amend this issue and increase the generalizability of our findings to the targeted population by recruiting children from different urban parts of the country. Our sample was further limited by including children from relatively low-income families, even if parental educational levels were somewhat high. This could be explained by the country's socio-economic context, which does not always provide the opportunities for well-educated individuals to align their income with the educational level (Andreea, 2013).

Finally, we acknowledge that the current study mainly addressed the direct effects of the socio-cognitive variables concerning children's dishonest behaviors (cheating, lie-telling, and semantic leakage control). This was due to the limited previous evidence on the indirect interrelations between these variables in middle childhood. More research is needed in order to capture the true complexity of the complex network of factors influencing dishonesty among school-age children and test the indirect effects as well.

3.4.4.5. Implications

The central contribution of our study represents a more nuanced perspective of children's dishonesty during middle childhood, considering its connection to important socio-cognitive factors, such as interpretive diversity understanding (IDU). As Moldovan and collab. (2020) argued, IDU might significantly influence children's deceptive process beyond preschool years. Present results support positive associations between IDU and children's cheating, lie-telling and semantic leakage control. This cognitive ability might allow them to recognize that multiple versions of the "truth" might exist regarding a specific situation and plan their subsequent actions accordingly. These preliminary results can be relevant to the limited research on what happens beyond preschool years when more advanced forms of ToM emerge and how these developments may contribute to children's dishonesty.

At the same time, the current study represents an extension to the parental involvement research showing the importance of their rearing behaviors for shaping children's dishonesty. The present findings suggest that even in middle childhood, children's interaction with caregivers may still greatly influence the behavioral strategies they use in certain situations (Buschgens et al., 2010). Moreover, the fact that parental rejection represented a positive predictor for children's cheating and lying behavior may help parents understand that in time, their behavior towards their children might be associated with their social conduct, and that is of great importance to monitor how children perceive their relationship.

Finally, the current study provides important insights into how honesty promotion strategies could be designed and implemented. For example, considering that children's cheating and lie-telling behavior were both positively associated with parental rejection, honesty could be indirectly reinforced by parents through their rearing practices. This is supported by previous literature showing that adolescents with supportive parents are putting more value on honesty than those with controlling parents (Bureau & Mageau, 2014).

Moreover, the fact that different ToMc processes support children's deception behavior represents essential new evidence for the economic framework regarding children's deception. We know that middle-aged children are capable of making decisions about deceiving or not based on careful consideration of the mental processes involved and the costs associated (Walczyk & Fargerson, 2019). This can inform the interventions that seek to manipulate these kinds of expectations in children by reducing the perceived benefits of deception (Hertwig & Mazar, 2022).

3.4.4.6. Conclusions

To summarize, the current study brings together various contextual, parental, and cognitive predictors of children's dishonest behavior for the first time in a unitary design, providing a more nuanced understanding of these social acts during middle childhood. The present findings suggest that children's ability to understand the constructive nature of the human mind is related to their cheating and subsequent ability to lie and maintain elaborate lies. Moreover, the current investigation provides further evidence concerning the parental influence on children's cognitively complex dishonesty. Our findings support the idea that parental rejection may fosters dishonesty while being a mediator of the relation between SES and children's peeking and lie-telling behavior. Lastly, we provided preliminary evidence for the differences in lie-telling between monolingual and bilingual school-aged children, opening new avenues for research into this interplay.

CHAPTER IV. GENERAL DISCUSSION AND CONCLUSIONS

The overarching aim of the current thesis was to investigate the interrelations between individual and contextual factors and school-age children's self-serving dishonest behavior across different competitive settings. To this end, ***we addressed distinct types of dishonest behavior*** in ***longitudinal*** and ***cross-sectional designs*** focusing on children's strategic deception to conceal relevant information or mislead others for personal gains. Building on previous and current findings, we proposed a ***new theoretical framework*** for the relatively understudied forms of children's deception (e.g., second-order deception) and shed some light on their socio-cognitive correlates. Throughout the current investigations, we focused on ***individual*** (baseline cognitive processes, theory of mind, executive functions, and internalizing symptoms) and ***socio-environmental factors*** (parental practices, peer relationships, socioeconomic status, and bilingual education) predicting children's self-serving dishonesty in middle childhood. Based on these intricacies and previous theoretical accounts, we advanced a ***new integrative model of children's self-serving dishonesty in middle childhood*** that bridges together a part of the individual and contextual factors associated with their propensity and proficiency to be dishonest.

To achieve the underlying theoretical goal of the current thesis, we developed ***new experimental testing paradigms*** in order to ***ecologically access children's different levels of dishonesty in various motivational settings*** (e.g., misleading an adult or familiar/unfamiliar peers for personal gain). Lastly, the practical standpoint of the thesis was set out to advance the understanding of children's ability to withhold evidence by ***keeping a secret*** and ***validate a memory-based paradigm*** meant to discriminate between knowledgeable and unknowledgeable children**.**

4.1. Theoretical Contributions

In line with our extensive goal of exploring different levels of sophistication in school-age children's self-serving dishonesty, we started by focusing on one of the most elementary aspects that may imply dishonesty – *secrecy*. ***Study 1*** focused on schoolchildren's ***ability to withhold evidence*** (by keeping a secret) through ***non-verbal denials*** about the recognition of relevant stimuli in a memory-based paradigm, namely the *Reaction Time Concealed Information Test* (RT-CIT). Various meta-analyses of CIT studies found a remarkable detection efficiency of this test, but all these investigations were conducted on adult samples (Meijer et al., 2014; Suchotzki et al., 2017), with only one attempt to replicate this effect on children's concealments (Visu-Petra et al., 2016). Early investigations of children's orienting responses (OR) demonstrated that young children's OR were relatively weak (Furuseth, 1993; Lieblich, 1969) due to their poorer dichotomization abilities, being less skilled in distinguishing between different types of stimuli (Lieblich, 1969). We replicated the ***CIT effect in schoolchildren*** in different motivational contexts (avoiding negative consequences for themselves or others), thus validating ***the OR theory*** (Sokolov, 1996) ***in children*** by showing the exitance of stronger ORs to relevant/familiar stimuli in knowledgeable participants ***over time***. We also provided preliminary evidence on how their ***OR may be modulated by the motivational context of concealment***, demonstrating an increased CIT effect (meaning better detection efficiency or hit rates) when children concealed information to avoid hurting others' feelings than when they did that to avoid punishment. Both contexts could imply a self-serving motivation (in prosocial contexts, they could conceal information to avoid the adverse reactions of the person whose feelings were hurt), but maybe thinking about others imposed a greater cognitive load and led to higher reaction times. This could have significant theoretical implications for understanding how the context of secret-keeping may influence children's ability to withhold information. In addition, our evidence supported Bond's (2012) theoretical account of the ***importance of processing speed in dishonest communication***, demonstrating a positive relation between children's accuracy and information processing abilities. All these may significantly contribute to our current limited understanding of the ***mechanisms behind children's concealments*** in real-life legal contexts (e.g., abuse cases).

Going beyond children's simple denials, the current thesis sought to address the socio-cognitive mechanism underlying their more sophisticated deceptive behaviors. In ***Study 2***, we focused on children's ***second-order deception***, complementing the previous limited literature on this deceptive strategy by providing a ***more nuanced theoretical perspective of its levels of sophistication and corresponding socio-cognitive mechanisms***. Therefore, we proposed the distinction between ***elementary vs. advanced second-order deception*** stemming from the complexity of their construction and delivery (e.g., *elementary* - simple, dichotomous indications using truths and lies vs. *advanced* - elaborate explanations provided by alternating between truths and lies). Besides pinpointing how these would unfold in real-life situations, we contributed to their ***theoretical underpinnings*** by demonstrating how key ***socio-cognitive factors (theory of mind and executive functions)*** are associated with children's ability to use elementary second-order deception in a highly competitive setting. In line with previous literature on adults (Voltz et al., 2015; Carrion et al., 2010), we showed that ***intent*** is the key ingredient of children's deception and that a precursor of the second-order theory of mind (*second-order ignorance attribution*) was positively related to their ability to deceive using truths and lies. Anticipating others' awareness of their deceptive intentions based on the contextual cues (the hide-and-seek zero-sum game) allowed children to implement strategic deceptive plots, which could be indicative of the importance of emphasizing others' intentions rather than apparent behavior when evaluating their actions. This theoretical switch from evaluating behaviors to ***judging the underlying intentions may contribute to children's moral development*** and inform how social agents can endorse it. Lastly, our findings on executive functions and elementary second-order deception also contribute to the nuanced perspective of how ***different executive processes are employed depending on the sophistication of children's deceptive endeavors***. We provided preliminary evidence that working memory significantly contributes to children's elementary second-order deception, but we also pinpointed the core overlap between executive functions. We also showed that inhibitory control may also be involved in children's elementary second-order deception when excluding the effect of working memory, addressing the intricacies of children's cognitive development in school-age years.

Past literature provided well-documented evidence on children's willingness to deceive others for personal gains (e.g., Evans & Lee, 2011; Talwar & Lee, 2008; Williams et al., 2017), but this could be modulated by the target's level of familiarity (Williams et al., 2013). Advancing the understanding of these social influences, we demonstrated that children's propensity to deceive could also be influenced by their peers' familiarity and level of truthfulness. ***Study 3*** focused on ***peer relationships as a specific motivational context for children's deception***, which did not receive much attention in previous literature. We aimed to assess the extent to which self-serving deception in middle childhood could be subjected to peers' influence depending on the opponents' familiarity (familiar vs. unfamiliar peers) and to address the involvement of the ***socio-cognitive factors in children's ability to employ specific deceptive strategies***. We provided preliminary evidence on ***children's social peer preferences from early school years***, with primary school years being considered the emergence point of significant peer relationships (Bosacki, 2021). We found that children were less likely to deceive the familiar opponent compared to the unfamiliar opponent, which complements the limited previous research on children's deceptive propensity toward peers in competitive settings, shedding some light on their developing understanding of ***the value of honesty in egalitarian relationships***, such as friendships (Fink, 2021). Besides deception, this investigation also contributed to the theoretical accounts of ***children's competitive behaviors with familiar and unfamiliar peers,*** aligning with early evidence of children's constructive competition toward familiar peers (Fonzi et al., 1997). To better understand what contributed to children's deceptive behavior depending on specific modalities of the targets and their actions, we were also able to pinpoint the socio-cognitive mechanisms by investigating children's theory of mind and executive functions. Our findings suggest that higher-order theory of mind and executive functions significantly predicted children's more sophisticated deceptive strategies (e.g., using truths to mislead others). This evidence is highly relevant for a more nuanced understanding of how children's ***socio-cognitive development may assist children's deception to different extents depending on its sophistication***, which aligns with previous theoretical accounts (e.g., three-stage model; Talwar & Lee, 2008 or ADCAT-child; Walczyk & Fargerson, 2019) arguing that ***higher-order socio-cognitive skills foster children's ability to employ more sophisticated types of deception***.

We also aimed to investigate even ***more complex types of children's deception in relation to advanced theory of mind and to intersect this with some of the most relevant contextual factors (Study 4***). For the first time in the literature, we investigated children's interpretive diversity understanding (higher-order ToM development) in relation to children's ***advanced verbal deception***. We demonstrated that children's nuanced understanding of the active nature of the human mind was significantly associated with children's cheating, lie-telling, and semantic leakage control (Weimer et al., 2017). Previous theoretical grounds proposed that interpretive diversity understanding (IDU) may assist preadolescents in their complex forms of deception (Moldovan et al., 2020). We provided a more comprehensive image of the theoretical underpinnings of children's advanced deception by demonstrating how ***reasoning about processes like comprehension, planning, memory, or comparison assisted 9-to-11-year-olds in anticipating their recipient's beliefs and actions*** in a competitive game. We were also interested in the association with ***essential contextual factors, assessing parental practices, socioeconomic status, and bilingual education***. We demonstrated significant relations between these socio-environmental factors and children's advanced lie-telling for personal gain, thus complementing previous theoretical accounts on ***the contextual influences on children's deception*** (Talwar et al., 2022; Talwar & Crossman, 2022). Along with testing the direct effects of individual and contextual factors, we also contributed to the limited understanding of the ***interrelations between socio-cognitive and contextual factors***, showing the relation between advanced ToM, bilingual education, and children's decision to lie.

The evidence provided by our studies set the stage for ***a new integrative model of children's self-serving dishonesty in middle childhood, unifying some of the most relevant individual and contextual factors***. This is one of the fewest attempts to integrate the socio-cognitive and socio-environmental factors with children's different types of dishonest behaviors in terms of their complexity. Table 4.1.1. summarizes the theoretical contributions of the current thesis.

Table 4.1.1. *The Main Theoretical Contributions of the Current Thesis*

Study	Aim	Main theoretical contributions
Study 1	Longitudinally test children's secret-keeping in the RT-CIT and the socio-cognitive factors involved	- Validate the ***Orienting Response theory in school-age children*** by demonstrating the differential orienting response toward familiar stimuli in knowledgeable children
Study 2	Assess children's elementary second-order deception and its socio-cognitive correlates	- Nuanced perspective on ***second-order deception***, distinguishing between ***elementary vs. second-order deception*** - Contribute to understanding the importance of ***theory of mind and intent for deceptive behavior*** and how this could assist children's moral development. - Advance the understanding of ***EFs' involvement in second-order deception*** and how they overlap in middle childhood.
Study 3	Investigate children's deception toward peers and their socio-cognitive skills	- Provided preliminary evidence on children's ***social peer preferences*** from early school-age years and their increasing ***understanding of the importance of honesty*** in peer relationships - Advance the understanding of how ***higher-order socio-cognitive skills assist children's sophisticated deceptive strategies***
Study 4	Test the association between advanced ToM, contextual factors, and children's advanced verbal deception	- Contribute to the ***theoretical underpinnings of children's advanced verbal deception and ToM*** by demonstrating how understanding different mental processes is associated with children's cheating, lie-telling, and semantic leakage control. - Provide support for our ***new integrative model*** on the individual and contextual factors of ***children's self-serving dishonesty in middle childhood (overall theoretical contribution of the current thesis).***

4.2. Empirical Contributions

From a practical standpoint, ***Study 1*** addressed the longitudinal reliability of the RT-CIT paradigm in school-age children. To this end, in a ***two-time assessment design,*** we demonstrated that ***RT-CIT could be a reliable tool for distinguishing between children who possess relevant information in critical contexts and those who do not***, informing practitioners of its possible utility in legal settings. To the best of our knowledge, this is the first empirical study to address the possibility of re-administering RT-CIT. Crucially, our results suggested that ***its detection efficacy was higher at Time 2*** (i.e., knowledgeable children were better detected at Time 2 compared to Time 1), replicating other convergent findings on children's accuracy in repeated interviewing (O'Neil & Zajac, 2013). Conversely, we also demonstrated that ***RT-CIT is a robust paradigm for detecting knowledgeable children, which was not significantly influenced by individual differences in children's theory of mind understanding, executive functioning, or internalizing symptoms***. The only significant cognitive factor for children's response latency in RT-CIT was processing speed, with children with higher processing speed having lower reaction times when responding during the memory test. Nevertheless, this effect was general, meaning there was no interaction between children's processing abilities and CIT condition (knowledgeable vs. unknowledgeable subjects). This may indicate that processing speed has a general contribution, allowing children to react more swiftly and does not interact with the orienting response of knowledgeable children to relevant information.

Starting with ***Study 2***, we pursued our overarching goal of developing new paradigms of accessing children's deceptive behavior in various motivational contexts. More specifically, we focused on children's second-order deception and addressed its ***structural features and the socio-cognitive factors associated with it in a modified hide-and-seek paradigm***. Through this novel adaptation of the hide-and-seek paradigm, we tested ***children's understanding of others' intentions and actions when there was no systematic rule to follow and their ability to flexibly adapt to these changes***. In this cognitively demanding setting, we provided the first empirical evidence of school-age children's elementary second-order deception and the socio-cognitive mechanisms underlying it. We demonstrated ***that second-order ignorance attribution and verbal working memory positively predicted children's elementary second-order deception*** referring to its elementary features in terms of its construction based on the components of the ADCAT model (Walczyk et al., 2014; Walczyk & Fargerson, 2019). Addressing its structural features and the factors that may modulate it, we also demonstrated the possibility of ***habituation***, showing children's higher accuracy when telling lies to deceive (the more frequent type of response elicited) compared to their performance when using lies to deceive. This is a valuable contribution because it is the ***first attempt to investigate the habituation effect in children's second-order deception specifically and in child deception more generally***. It also has major implications for how we define truth-telling vs. lie-telling and the extent to which we possess a universal cognitive default response set.

In ***Study 3***, we changed the motivational context of children's deception by experimentally investigating children's willingness to deceive familiar and unfamiliar peers in a highly competitive computerized game. To this end, ***we developed a new hide-and-seek paradigm assessing children's strategic peer deception for personal gain*** as a function of stimuli type (liked vs. disliked), peer opponents' familiarity (familiar vs. unfamiliar peers), and actions (following vs. not following children's indication about the objects' location). The newly developed competitive game represents a playful, ecological method for assessing ***children's propensity to mislead peers***. It resembles the rule-structured games they play at that age and involves salient stimuli (stickers with various cartoon characters adapted for their age). More so, it allows for ***assessing multiple forms of behavioral deception*** (from simple to more sophisticated strategies, like telling the truth to deceive) while ***simulating social interactions in which children may have to tell lies in the presence of multiple peers*** (e.g., other friends). In this regard, we showed that children's ability to employ more ***complex deceptive strategies*** (e.g., telling truths and/or lies to mislead the opponents who were aware of their deceptive intentions) was ***significantly related to their higher-order ToM*** (second-order false belief understanding) and ***EFs*** (inhibitory control, cognitive flexibility, and visuospatial working memory). This complements and extends previous literature on the nuanced associations between children's socio-cognitive development and the complexity of their deceptive plots for self-serving purposes in middle childhood.

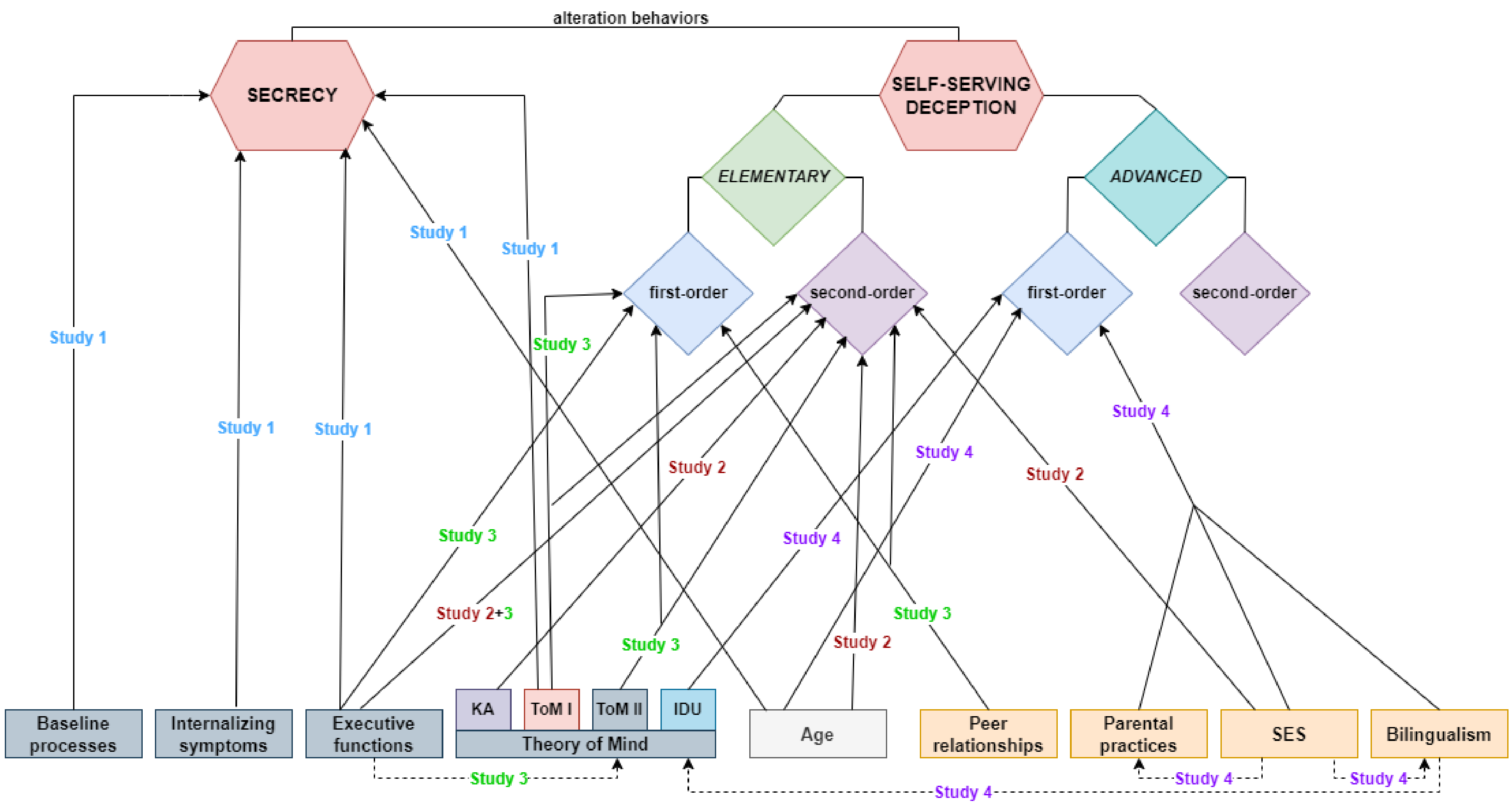
Finally, in ***Study 4***, we aimed to investigate the socio-cognitive and contextual factors associated with children's ***advanced verbal self-oriented deception*** in competitive contexts (trivia games). To this end, we devised a more ***complex version of the temptation to resistance paradigm (TRP)*** in order to advance our understanding of children's ability to tell complex lies. This new paradigm allowed us to ***capture children's variability in cheating, lie-telling, and semantic leakage control***, adhering to a more ***fine-grained perspective on dishonest profiles***. This aligns with the recent individual-level analysis of dishonesty coming from adult samples (Muñoz Garcia et al., 2023; Pascual-Ezama et al., 2020). More so, we intersected children's advanced ToM abilities (interpretive diversity understanding) with some of the most relevant contextual factors (parental practices, socioeconomic status, and bilingual education), offering, for the first time in the literature, empirical support for theoretical accounts arguing the involvement of *interpretive diversity understanding* (IDU) in children's sophisticated deception (Moldovan et al., 2020; Walczyk & Fargerson, 2019). This provides ***empirical support for the developmental model of***

children's deception proposed by Walczyk and Fargerson (2019) – ADCAT, positing that higher-order ToM may allow children to anticipate the contexts in which deception is profitable and the elaborate plausible lies. We also found that some components of IDU mediate the relation between bilingual education and children's lie-telling, ***bridging the disparate literature on the relation between ToM and bilingualism on the one hand*** (Goetz, 2003), ***and the research on bilingualism and deception on the other hand*** (Suchotzki & Gamer, 2018). Lastly, children's propensity to cheat and lie was significantly associated with parental practices (e.g., *parental rejection*) and socioeconomic status proxies (e.g., *income and maternal education*), thus ***contributing to our understanding of how certain proximal (social agents) and distal contextual factors (financial welfare or education) are associated with children's self-benefitting deceptive behavior in middle childhood***. Table 4.2.1. summarizes the current thesis's major empirical contributions.

Table 4.2.1. *The Main Empirical Contributions of the Current Thesis*

Study	Type of dishonest behavior	Testing paradigm	Individual and/or contextual factors	Age range	Main conclusions
Study 1	Secrecy	RT-CIT	Baseline processes, ToM, EFs, internalizing symptoms	8-11 (T1) and 9-12 years (T2) (N = 194)	- The presence of the CIT effect in knowledgeable children - Processing speed negatively associated with response latency
Study 2	Elementary second-order deception	Hide-and-seek	First- and second-order ignorance, EFs	8-10 years (N = 101)	- Second-order ignorance and working memory positively predicted children's elementary second-order deception - The presence of a habituation effect in children's truth-telling to deceive
Study 3	First- and second-order deception	Hide-and-seek	ToM, EFs, and peer relationships	6-8 years (N = 75)	- Children's willingness to deceive unfamiliar peers more than familiar ones - Children's truth-telling to deceive is significantly associated with second-order ToM and EFs
Study 4	Advanced verbal first-order deception	Resistance to temptation	Interpretive diversity understanding, parental practices, socioeconomic status, and bilingual education	9-11 years (N = 196)	- Cheating, lying, and semantic leakage control predicted by different mental processes understanding (IDU) - Some components of IDU mediated the relation between bilingual education and lie-telling - Parental rejection and socioeconomic status proxies significantly predicted children's cheating and lie-telling propensity

Figure 4.2.1. *Overview of the Links Explored in the Current Thesis*



TOPAN MIHAELA
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4.3. Limitations

Despite its essential contributions to the literature, the current thesis presents some limitations that need to be acknowledged. First, a ***methodological*** cautionary note must be mentioned, given that we adapted or developed new testing paradigms to assess children's dishonesty in all the studies of the current thesis. Even though the new tasks improved the ecological validity of assessing children's dishonest behavior, we acknowledge that we did not address their ***convergent validity***. Future research should tap into this aspect by using the new tasks along with other, more established, measurements of the same constructs to replicate our findings. Second, we used relatively ***limited age ranges*** (Study 3 and 4), which led to little variation in children's socio-cognitive development. Therefore, it was less likely to capture the age-related changes in children's deceptive behavior and their socio-cognitive skills. However, we chose these age groups based on our specific focus on middle childhood in order to capture the interrelations between children's dishonesty, individual, and contextual factors in this important developmental window. More longitudinal studies are needed in order to allow for causal inferences of the relations we obtained between individual and contextual factors and children's self-serving dishonesty in middle childhood.

We proposed an integrative model of children's self-serving dishonesty that unifies some of the most relevant individual and contextual factors associated. Nevertheless, we acknowledge that we did not empirically test all its components (e.g., advanced second-order deception). At this stage, we provided a theoretical distinction between elementary and advanced second-order deception that has to be empirically validated by future research. Furthermore, we recognize the importance of other predictors for children's dishonesty in middle childhood that we did not test, as well as other important dishonest outcomes that need further investigation. With regard to predictors, previous research stressed the importance of ***culture*** as one of the most influential contextual factors for children's internalization of honesty and the propensity of their lie-telling behavior (Lee & Imuta, 2021; Tong et al., 2023), emphasizing the need for more cross-cultural studies. Other individual predictors, such as ***intelligence or self-awareness*** (Ding et al., 2019; Talwar & Crossman, 2011), are also relevant for children's dishonesty and need further investigation. In terms of potential outcomes, it would be theoretically and methodologically important to address children's self-serving dishonesty in other social settings, such as ***telling a lie for reputational gains***. Previous findings suggest that children negatively evaluated lies that affected others' social reputations (Shaw & Olson, 2015), but less is known about how they would behave when their reputation is at stake. Lastly, since children's dishonesty is more socially oriented with increasing age, investigating their propensity and proficiency to deceive for ***prosocial*** reasons in conjunction with essential individual and contextual factors may also be very important for understanding their increasing ability to navigate the social environment adaptively.

Lastly, a common limitation of dishonesty research that applies to the current thesis is the ***ethical difficulties*** raised by assessing school-age children's dishonesty (Fisher, 2005). Because we addressed this socially controversial behavior, providing participants with full debriefings regarding the studies' objectives and methodology was more challenging. In all our studies, we obtained parental informed consent and offered parents explanations regarding the testing protocols, their durations, and brief information on what they entailed. However, we could not specifically explain every aspect because we wanted to preserve our data's scientific validity. This is known in the literature as the *methodological paradox* of studying dishonesty in child samples (Fisher, 2005). Nevertheless, all the present investigations were approved by the Institutional Review Board and followed the ethical guidelines from the National College of Psychologists and international guidelines from the Declaration of Helsinki (1964) for research involving human subjects.

4.4. Practical Implications

The current thesis' results have significant implications for understanding children's dishonesty in middle childhood and the individual and contextual forces shaping it, informing practice in several areas. Notably, the fact that we provided the first empirical validation for the re-administration of RT-CIT across two time points can inform practitioners working with children in legal contexts about the possibility of using this tool to assess children's knowledge in specific settings (Study 1). This also has broader implications for the ***investigative interviewing of vulnerable witnesses*** (children), replicating previous research on children's lower accuracy when re-interviewed, which can have critical ramifications for children's credibility in legal settings.

Emphasizing the importance of ***intent*** instead of the truth value of individuals' statements when judging deception holds important implications for ***children's moral reasoning and behavior***. In Study 2 and 3 we demonstrated that children can tell truths and lies to deceive a suspicious target and that their rudimentary or advanced mentalizing abilities (second-order theory of mind or its early precursors) are significantly associated with their propensity to use these deceptive strategies. Stemming from this evidence, we pinpoint the importance of understanding and evaluating others' intentions when making inferences about their behavior (e.g., told with deceptive intent, the truth can become manipulative). Training children's ***understanding of intention*** and its impact on others' behaviors can assist their ***moral development and epistemic vigilance*** (Ding et al., 2022) and inform educators how to facilitate it. One way would be to employ theory of mind training in morally relevant contexts (morally relevant theory of mind training

TOPAN MIHAELA
2023.10.16 13:33

involving accidental transgressions; Killen et al., 2011) to improve their reasoning about others' prosocial or antisocial intentions.

We also addressed socio-environmental factors' importance, demonstrating that caregivers and peers may influence children's propensity and proficiency to act dishonestly. This could ***inform educators and parents about their role in shaping children's path to honesty and morality*** since a growing body of research has demonstrated that parental practices modulate children's dishonesty (Eguaras et al., 2020; Talwar & Crossman, 2022). Moreover, for the first time in the literature, we experimentally showed children's lower propensity to deceive a familiar peer than an unfamiliar one. Even though this is just preliminary evidence that needs replication, our findings emphasize ***the importance of peer relationships*** from early school years. This could enrich honesty-promoting strategies by assisting children in building strong and positive peer relationships that may, in turn, discourage their reliance on dishonesty for self-serving goals.

4.5. Final Conclusions

In conclusion, the current thesis complements and extends the existing literature addressing the intricacies of children's self-serving dishonesty in middle childhood. Our findings highlight the importance of the individual and contextual factors involved in children's various types of dishonest behaviors in competitive contexts. Investigating the more understudied forms of deception (second-order deception) broadens our understanding of children's strategic deception by informing us how truth-telling can become manipulative in specific motivational contexts. The results also build upon the *normative perspective of children's self-serving dishonesty in middle childhood*, showing that their more sophisticated deceptive plots are assisted by advanced socio-cognitive skills (e.g., processing speed, theory of mind, and executive functions). Besides the individual factors shaping children's deceptive "*know-how*", the current thesis also addressed the contextual aspects underlying children's deceptive "*know-when*". Our findings suggest that the target's familiarity in a competitive game involving peer opponents was significantly associated with children's deceptive propensity, with a more honest tendency toward familiar peers. In the context of social agents, the present results complement previous research on the association between parental practices and dishonesty, replicating evidence of the relation between harsh parental behaviors and children's increasing reliance on dishonest acts. Other more distal contextual factors, such as bilingual education and socioeconomic status may also indirectly contribute to children's propensity to deceive. Lastly, building on previous literature and the current findings, the thesis presents an integrative model of children's self-serving dishonesty in middle childhood that bridges some of the essential individual and contextual factors associated and proposes new possible extensions, emphasizing the importance of addressing the interrelations between individual and socio-environmental forces in detangling the complex web children wave when they are deceiving.

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APPENDICES

Appendix A

Table 1. *The educational levels reported for mothers and fathers*

	Maternal education		Paternal education		
	Highschool degree	Bachelor's degree	Gymnasium degree	Highschool degree	Bachelor's degree
Knowledgeable Group	14%	24%	23%	20%	15%
Unknowledgeable Group	16%		-		23%

Table 2. *Correlations between ToM and RT-CIT Detection Efficiency at Time 1 and Time 2*

	1	2	3	4	5	6	7
1. Detection efficiency accuracy T1	-	**.391****	**.256****	**-.254****	**-.161***	-.021	**-.157***
2. Detection efficiency accuracy T2		-	.118	**-.179***	-.060	-.058	-.078
3. Detection efficiency RT T1			-	**-.185***	-.071	-.079	-.083
4. Detection efficiency RT T2				-	.026	.114	.066
5. Verbal ToM					-	.079	**.881****
6. Contextual ToM						-	**.422****
7. ToM total score							-

* $p < .05$ ** $p < .01$

Appendix B

Table 1. *Binomial Regression Predicting Children's Ability to Tell Second-Order Lies*

					95% CI for OR	
		β	Wald	OR	LL	UL
Step 1	Age	-0.10*	4.198	.499	.257	.970
	Maternal education	0.04	0.332	1.105	.788	1.549
	Paternal Education	-0.03	0.218	.915	.632	1.326
	Income	0.05	1.174	1.269	.825	1.951
Step 2	Age	-0.12	3.106	.448	.184	1.094
	Maternal education	0.02	0.076	1.073	.652	1.765
	Paternal education	-0.10	0.651	.788	.442	1.405
	Income	0.07	0.833	1.369	.698	2.686
	First-order ignorance	0.04	0.394	1.889	.259	13.763
	Second-order ignorance	0.33***	27.574	41.578	10.343	167.150
Step 3	Age	-0.18*	4.667	.291	0.095	0.892
	Maternal education	-0.00	0.001	.992	0.557	1.768

	Paternal Education	-0.15	1.069	.699	0.354	1.378
	Income	0.09	0.855	1.460	0.655	3.252
	First-order ignorance	0.07	1.206	2.976	0.425	20.842
	Second-order ignorance	0.29***	18.527	26.780	5.993	119.663
	Inhibitory control	-0.41*	5.831	.140	0.028	0.69
	Shifting ability	0.09	0.449	1.420	0.509	3.965
Step 4	Age	-0.37*	6.332	0.08	0.011	0.572
	Maternal education	0.16	0.738	1.462	0.614	3.482
	Paternal Education	-0.41	3.317	0.358	0.118	1.081
	Income	-0.11	0.761	0.631	0.224	1.776
	First-order ignorance	0.03	0.16	1.62	0.153	17.213
	Second-order ignorance	0.39**	10.549	84.38	5.805	1226.416
	Inhibitory control	-0.14	0.482	0.515	0.079	3.348
	Shifting ability	0.10	0.373	1.519	0.397	5.81
	Verbal working memory	0.74**	10.033	3.723	1.651	8.398

Note: *p<.05; **p<.01; ***p<.001; OR = Odds Ratio; CI = Confidence Interval

Table 2. *Mean Differences Between the No Lying Group and the Second-Order Lying Group on the Socio-Cognitive Measurements*

	No Lying Group (n = 15)	Second-Order Lying Group (n = 72)
	M (SD)	M (SD)
First-Order Ignorance	1.667 (0.488)	1.994 (0.230)
Second-Order Ignorance	1.333 (0.488)	1.917 (0.278)
Inhibitory Control Index	2.992 (1.052)	2.083 (0.558)
Verbal Working Memory	9.733 (2.548)	14.014 (2.952)
Shifting Ability Index	2.995 (1.935)	3.343 (0.995)

Table 3. *Descriptive Statistics as a Function of Age*

	8–9-year-olds		10-year-olds			
	M	SD	M	SD	*t*	*p*
Inhibitory Control Index	2.40	0.76	2.30	1.34	0.46	.646
Shifting Index	3.80	1.17	2.87	1.18	**3.98**	**.000****
Verbal Working Memory	12.53	3.15	13.04	3.66	-0.73	.462
First-Order Ignorance	1.90	0.29	1.83	0.37	1.00	.319
Second-Order Ignorance	1.78	0.41	1.63	0.48	1.73	.085
Lie-telling Accuracy (%)						
Round 1 (Truth 1)	78.31	17.37	73.85	16.94	1.30	.195
Round 2 (Lie 1)	53.58	23.40	47.11	29.15	1.23	.220
Round 3 (Truth 2)	71.91	18.81	71.89	22.53	0.00	.996
Rounds 1-3	64.33	8.16	60.62	11.61	1.86	.065
Round 4 (Random Round)	43.40	22.08	41.39	21.27	0.46	.643
Round 5 (Lie 2.1/Truth 3.1)	57.28	26.84	52.59	29.50	0.83	.405
Round 6 (Truth 3.2/Lie 2.2)	72.63	18.30	66.33	25.99	1.41	.160

Rounds 5-6	62.21	14.99	55.99	16.98	1.95	.054
Overall accuracy across all rounds	63.14	9.84	58.33	11.82	**2.22**	**.028***

Note: The Inhibitory Control and Shifting Indexes were calculated as time over accuracy throughout the tasks
Significant differences are bolded.
**p* < .05; ** *p* < .001

Table 4. *Descriptive Statistics as a Function of Age and Second-Order Deceptive Behavior*

	8–9-year-olds				10-year-olds			
	Non-Deceptive (*n = 10*)		Deceptive (*n = 42*)		Non-Deceptive (*n = 19*)		Deceptive (*n = 30*)	
	M	SD	M	SD	M	SD	M	SD
Inhibitory Control Index	3.22	0.91	2.21	0.58	2.94	1.94	1.90	0.46
Shifting Index	4.37	1.54	3.67	1.048	2.86	1.72	2.87	0.70
Verbal Working Memory	9.30	1.56	13.31	2.95	9.94	2.75	15.00	2.70
*First-Order Ignorance	1.90	0.31	1.90	0.29	1.57	0.50	2.00	0.00
*Second-Order Ignorance	1.40	0.51	1.88	0.32	1.10	0.31	1.96	0.18
Lie-telling Accuracy (%)								
Round 1 (Truth 1)	83.52	22.84	77.07	15.89	75.93	22.39	72.53	12.62
Round 2 (Lie 1)	15.14	25.69	62.74	9.50	18.79	26.10	65.04	11.20

Round 3 (Truth 2)	83.71	30.47	69.10	13.94	77.19	30.45	68.53	15.32
Rounds 1-3	51.47	7.50	67.40	4.54	50.09	8.78	67.29	7.540
Round 4 (Random Round)	45.71	19.97	42.85	22.75	45.11	26.62	39.04	17.16
Round 5 (Lie 2.1/Truth 3.1)	11.42	19.97	68.20	13.18	30.27	35.28	66.73	11.62
Round 6 (Truth 3.2/Lie 2.2)	85.23	24.63	69.63	15.34	63.05	39.59	68.41	11.57
Rounds 5-6	39.14	11.10	67.70	9.59	38.91	12.31	66.82	8.42
Overall accuracy across all rounds	46.11	6.95	67.19	4.73	45.18	5.31	66.65	5.39

Note: The Inhibitory Control and Shifting Indexes were calculated as time over accuracy throughout the tasks

*An ANOVA was employed to test for the differences in children's mean performances across socio-cognitive tasks as a function of age and second-order deceptive behavior, followed by Bonferroni post-hoc contrasts for pairwise comparisons. Even though the 10-year-old non-deceptive children had lower performances on first- and second-order ignorance than the non-deceptive 8-to-9-year-olds, the differences were non-significant. Given the very small number of children in the two non-deceptive age groups, these mean performance scores should be interpreted with caution. For the deceptive children, descriptive statistics indicated that 10-years old children had higher scores than 8-to-9-year-olds even if those differences were not significant as well. These results could be explained by the restrictive age range in the current investigation that did not allow us to capture the true variability of children's performance in the socio-cognitive tasks as a function of age.

Appendix C

The descriptive data in Table S1 shows the frequency of participants' indications for these variables in the total number of true/false indications and percentages for each. To examine whether there were significant differences in children's indications depending on card type, opponents' actions, and familiarity, chi-square analyses were performed. There was a significant difference in children's indication depending on the card type, $\chi^2(2) = 150.77$, $p < .001$, with children indicating the actual location for the disliked cards and the wrong location for the liked cards. Similarly, we obtained a significant difference depending on opponents' actions, $\chi^2(2) = 14.32$, $p < .001$, but a non-significant difference for the opponents' familiarity $\chi^2(2) = 4.17$, $p = .123$.

Table 1. *The Participants' Frequencies in Pointing to the Cards' Location Across Different Cards' Type, Opponents' Action, and Opponents' Familiarity*

Participant pointing	Card type		Opponent action		Opponent familiarity		Total
	disliked	liked	opposite	same	unfamiliar	familiar	
No response	17 1.1 %	31 2.1 %	13 0.9 %	35 2.3 %	30 1.3 %	18 2.4 %	48 1.6 %
True location	914 60.9 %	578 38.5 %	779 51.9 %	713 47.5 %	1126 50 %	366 48.8 %	1492 49.7 %
False location	569 37.9 %	891 59.4 %	708 47.2 %	752 50.1 %	1094 48.6 %	366 48.8 %	1460 48.7 %

Table 2. *Linear Mixed Model Analysis for Predicting Children's Performance in the Deceptive Game*

Predictors	**Estimates**	**95% CI**	***p***
Intercept	0.49	0.12 – 0.86	**.010**
Trial type – LikedSame	0.07	-0.46 – 0.59	.802
Trial type – DislikedOpposite	-0.30	-0.83 – 0.22	.259
Trial type – LikedOpposite	-0.18	-0.71 – 0.34	.494
First-order false belief understanding	0.07	-0.04 – 0.19	.217
Second-order false belief understanding	-0.00	-0.11 – 0.11	.983
Inhibitory control efficiency	0.01	-0.07 – 0.10	.742
Cognitive flexibility efficiency	-0.01	-0.05 – 0.04	.832
Visuospatial working memory	0.02	-0.01 – 0.05	.163
Trial type – LikedSame * First-order false belief understanding	0.01	-0.15 – 0.18	.862
Trial type – DislikedOpposite * First-order false belief understanding	-0.02	-0.18 – 0.14	.813
Trial type – LikedOpposite * First-order false belief understanding	0.02	-0.14 – 0.19	.768
Trial type – LikedSame * Second-order false belief understanding	0.04	-0.12 – 0.19	.660

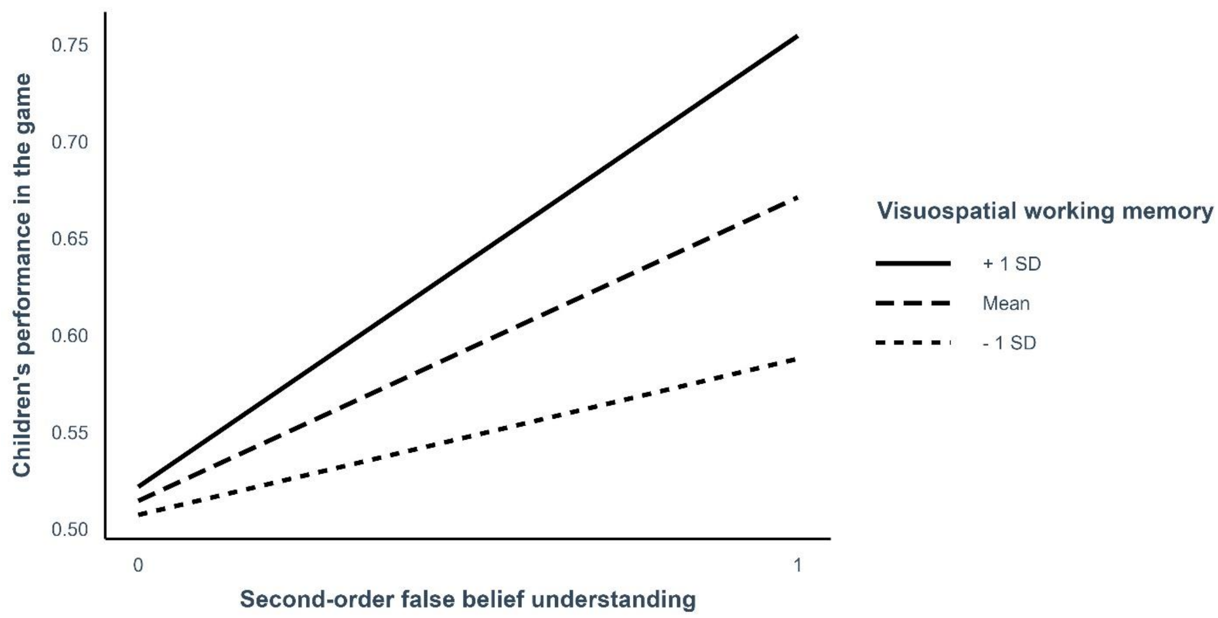
Trial type – DislikedOpposite * Second-order false belief understanding	0.17	0.01 – 0.32	**.042**
Trial type - LikedOpposite * Second-order false belief understanding	0.28	0.12 – 0.44	**.001**
Trial type – LikedSame * Inhibitory control efficiency	0.01	-0.11 – 0.13	.867
Trial type – DislikedOpposite * Inhibitory control efficiency	-0.01	-0.13 – 0.11	.839
Trial type – LikedOpposite * Inhibitory control efficiency	0.01	-0.11 – 0.13	.893
Trial type – LikedSame * Cognitive flexibility efficiency	-0.00	-0.07 – 0.07	.960
Trial type – DislikedOpposite * Cognitive flexibility efficiency	-0.02	-0.08 – 0.05	.633
Trial type – LikedOpposite * Cognitive flexibility efficiency	-0.06	-0.13 – 0.01	.095
Trial type – LikedSame * Visuospatial working memory	-0.01	-0.05 – 0.03	.585
Trial type – DislikedOpposite * Visuospatial working memory	0.01	-0.03 – 0.05	.587
Trial type – LikedOpposite * Visuospatial working memory	0.01	-0.04 – 0.05	.767
Random Effects			
σ^2	0.05		
τ_{00} participant	0.00		

N $_{participant}$	75
Observations	300
Marginal R^2 / Conditional R^2	0.406 / NA

Note: σ^2 = residual variance; τ_{00} = variance of the random intercept (i.e., participants);

Figure 1.

The Moderation Effect of Visuospatial Working Memory on the Relationship Between Children's Deceptive Performance and Second-Order False Belief Understanding



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Appendix D

Bivariate correlations between lie-telling, semantic leakage control, and socio-cognitive factors among children who peeked at least once (n = 80).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.Peeking behavior	-	**.87****	-.08	.02	**.40****	-.15	.01	-.00	.05	**.36****	.02	.07	.12	-.07	**.21****	.10
2.Lying behavior		-	.07	.01	**.34****	.01	**-.33***	-.05	**.45****	**.25***	-.14	.09	**.30***	.06	-.10	-.11
3.Semantic leakage control			.-	.12	.18	.05	.12	.01	.15	.04	.10	.00	-.21	**.30****	-.09	-.08
4.Maternal education				**-**	**.24***	.09	.03	.12	.15	.11	-.17	.10	.03	**.26***	-.03	-.01
5. Income					-	.14	.02	.11	.20	-.06	.01	**.34****	.14	.15	.08	**-.25***
6. ToMc Droodle						-	-.02	.15	.07	-.02	**.25***	.13	.19	**.23***	-.19	.04
7.ToMc Comprehension							-	**.38****	-.05	-.18	.20	-.09	**-.29***	-.05	.17	.16
8.ToMc Attention								-	**.23****	.01	.13	**.23***	-.14	.10	.09	.01
9.ToMc Memory									-	.08	.05	.07	.02	-.04	-.16	.07
10.ToMc Comparison										-	-.04	.06	.08	-.03	-.01	-.09
11.ToMc Planning											-	.17	.05	-.00	-.16	.00
12.ToMc Inference												-	.17	**.22***	.05	-.07
13.Bilingualism													-	-.00	-.09	.08
14.Parental Emotional Warmth														-	-.04	.07
15.Parental Rejection															-	.14
16.Parental Overprotection																-