BABEŞ-BOLYAI UNIVERSITY
FACULTY OF PSYCHOLOGY AND EDUCATIONAL SCIENCES
DOCTORAL SCHOOL "APPLIED COGNITIVE PSYCHOLOGY"

Advanced Theory of Mind during Middle Childhood: Exploring Individual Differences in Interpretive Diversity Understanding

PHD THESIS

PhD candidate: Melania Moldovan
Scientific Supervisor: Assoc. prof. dr. habil. Laura Visu-Petra

2022
Cluj-Napoca

TABLE OF CONTENTS

ACKNOWLEDGMENTS 1

CHAPTER 1 2

THEORETICAL FRAMEWORK: INTERPRETIVE DIVERSITY UNDERSTANDING AND ITS RELATION TO COGNITIVE, EMOTIONAL AND PARENTAL CORRELATES 2

1.1. Introduction and Motivation 2

1.2. Conceptual Aspects 2

1.2.1. Interpretive Diversity Understanding 2

1.2.2. Emotional Individual Differences – Anxiety 4

1.2.4. Cognitive Individual Differences - Executive Functions 4

1.2.5. Context Correlates - Parental Practices 5

1.2.6. ToM at the intersection between Individual and Contextual Correlates 7

1.3. Methodological Aspects 7

1.3.1. Interpretive ToM Assessments 7

1.3.2. Constructivist ToM Assessments 8

1.4. Theoretical Models Accounts 8

1.4.1. The Active-Passive Hypothesis and the Three Levels of Conceptual Understanding of Mental Activities 8

1.4.2. Integrative Model of ToM in Middle Childhood by Weimer and Colleagues (2021) 9

1.4.3. Integrative Interpretive Diversity Understanding – Integrative Model 10

1.6. Thesis Overview and Research Questions 11

CHAPTER 2 12

STUDY 1: ADVANCED THEORY OF MIND AND EXECUTIVE FUNCTIONS DURING MIDDLE CHILDHOOD 12

2.1. Introduction 12

2.2. Method 14

2.3. Results 16

2.5. Discussion 17

CHAPTER 3 18

STUDY 2: THEORY OF MIND, ANXIETY SYMPTOMS AND INTERPRETIVE BIAS DURING MIDDLE CHILDHOOD 18

3.1. Introduction 18

3.2. Method 20
3.3. Results 23
3.4. Discussion 25
CHAPTER 4 27
RELATING INTERPRETATIVE DIVERSITY UNDERSTANDING TO ANXIETY SYMPTOMS AND PARENTAL PRACTICES IN MIDDLE CHILDHOOD 27
1.1. Introduction 27
1.2. Study 3 28
1.2.1. *Method* 28
1.2.2. *Results* 30
1.2.3. *Discussion* 31
1.3. Study 4 31
1.3.1. *Method* 31
1.3.2. *Results* 32
1.3.3. General Discussion 34
CHAPTER 5. 37
INDIVIDUAL DIFFERENCES IN INTERPRETIVE DIVERSITY UNDERSTANDING: AN INTEGRATIVE PERSPECTIVE 37
5.1. Thesis Overview 37
5.2. Research Questions: Main Findings 37
5.2.1. Are EF prerequisites for interpretive diversity understanding? 38
5.2.2. Are emotional individual differences negatively associated with interpretive diversity understanding? 38
5.2.3. Do parental practices influence interpretive diversity understanding? 38
5.2.4. Are the different types of interpretive diversity understanding interrelated? 38
5.3. Theoretical Contributions 44
5.3.1. ToM and EF 44
5.3.2. ToM and Anxiety 44
5.3.3. Tom and PP 44
5.3.4. Interrelations between ToM abilities 45
5.4. Empirical contributions 45
5.4.1. Study 1 45
5.4.2. Study 2 46
5.4.3. Study 3 46

5.4.4. Study 4.....47
5.5. Limitations 47
5.6. Practical Implications 47
5.7. Final Conclusions 48
References 49
Keywords: theory of mind, constructivist ToM, interpretive ToM, interpretive diversity understanding, anxiety, interpretive bias, executive functioning, parental practices, children, middle childhood

ACKNOWLEDGMENTS

I would like to express my very great appreciation to my PhD scientific supervisor, Assoc. prof. dr. habil. Laura Visu-Petra for her major contribution to this thesis and for her patience, guidance and encouragement during all these years. I am grateful for her continuous assistance with the conceptualization, methodological design and elaboration of this PhD thesis and for providing valuable guidance, support and feedback during the entire process of data collection, analysis and manuscript elaboration.

Furthermore, I would like to express my gratitude to my doctoral guidance committee, prof. dr. Oana Benga, lect. dr. Sebastian Pintea, and lect. dr. Lavinia Cheie, for their valuable feedback and support throughout these years. I would also like to express appreciation to my colleagues PhD candidates Narcisa Prodan and Daniela Seucan from RIDDLE Lab (Research In Individual and Legal Psychology Lab) for their valuable contribution to the research process and to PhD candidate Andra Coman for her contribution regarding data analysis. Additionally, I thank all my colleagues from the Developmental Psychology Lab and the RIDDLE Lab for their moral support and contribution to this thesis. Also, I would like to thank the volunteers and research assistants from the RIDDLE Lab for their assistance with data collection and data entry: Patricia Amaricăi, Iulia Fechete and Dragoș Lazăr.

Also, I would like to express my gratitude to the children and adults who kindly accepted to take part in this study and to education institutions and school counselors that offered access to participants as well as logistical assistance. In the end, I would like to thank my family, friends and last, but not least, my dear friends and colleagues from Minte Forte Association for their constant support and encouragement in this journey.

CHAPTER 1

THEORETICAL FRAMEWORK: INTERPRETIVE DIVERSITY UNDERSTANDING AND ITS RELATION TO COGNITIVE, EMOTIONAL AND PARENTAL CORRELATES

1.1.Introduction and Motivation

Theory of mind (ToM) is the socio-cognitive ability that allows us to reason about ours and other's minds, as well as how mental contens and processes influence behavior (Wellman et al., 2001). ToM is an indicator of social competence (Devine et al., 2016), peer acceptance, prosocial behavior (Imuta et al., 2016), and relationship quality (Slaughter et al., 2015). ToM has been extensively studied in preschool years (Devine & Hughes, 2013) with a recent shift towards childhood and adolescence (Weimer et al., 2021). *Interpretive diversity understanding*, an advanced ToM ability, reflects the understanding that the mind is constructive, and that two people exposed to the same situation can come up with different interpretations, due to their inner subjective processes (Miller, 2000; Weimar et al., 2017). It is a concept – umbrella that covers interpretive ToM and constructivist ToM. Being a socio-cognitive ability that deals with mental representations, it seems insightful to investigate it in the psychopathology framework, especially *anxiety*. Both anxiety and socio-cognitive abilities have been shown to be influenced by the *parental rearing behaviors* employed by the caregivers across development (Darling & Steinberg, 1993; Rapee, 1997). Another important cognitive factor in socio-cognitive and emotional development is the executive domain. Our aim is to provide a comprehensive and integrative analysis of interpretive diversity understanding by considering this construct across a variety of paradigms and tasks, in relation to various socioemotional and contextual factors.

1.2.Conceptual Aspects

1.2.1. Interpretive Diversity Understanding

Around the age of 6 years old, children increasingly understand that people can have different trains of thoughts, even when they are confronted with the same stimulus (Eisbach, 2004). The understanding of the mind as being constructive, has been approached in various ways in the literature, under the term of *interpretive ToM* (Lalonde & Chanlder, 2002), as well as *constructivist ToM* (Weimer et al., 2017).

1.2.1.1.Interpretive ToM

Interpretive ToM is an advanced form of this socio-cognitive ability that reflects children's understanding that two individuals that are confronted with the same stimuli may come up with different interpretations, due to differences in their beliefs, attitudes and expectations (Lalonde & Chandler, 2002; Pillow, 1991). Firstly, it implies the understanding that ambiguous stimuli can hold multiple interpretations by different individuals. Secondly, the understanding that subjective states influence how a particular interpretation is assigned, this process being considered a more complex stage (Miller, 2000). *The restricted view paradigm* was used as the methodological framework to investigate the first condition (Lalonde & Chandler, 2002), while the *biased cognition task* was employed for the latter (Pillow, 1991). By the age of 6-7-years-old, children perform very well on the restricted view paradigm (Carpendale & Chandler, 1996). It seems that interpretive ToM is, on its own, a multi-ability umbrella, with nuances that can be highlighted with different tasks variations. The variability in performance indicates an underlying diversity in the adopted strategies, alongside a conceptual development.

1.2.1.2.Constructivist ToM

Constructivist ToM has been coined by Weimer and colleagues' (2017) when introducing the Constructivist Theory of Mind interview, and refers to the understanding that knowledge can vary in certainty, and stimuli can be interpreted differently, due to the differentiation in how internal mental processes are employed. *Knowledge on the emergence of mental concepts* is thought to be the cornerstone for the understanding of the constructivist nature of mental activity. In this framework, researchers have developed an interview. Children were considered to have a good performance if they could explain differences in cognitive outcomes as a product of active mental processes as opposed to external stimuli. The explanations greatly changed between 10 and 12 years of age (Weimer et al., 2017). The passing age is slightly higher than the one found for the interpretive ToM tasks.

1.2.1.3.Interpretive Diversity Understanding, Social Outcomes and Psychopathology

Interpretive diversity understanding has been investigated in the *context of psychopathology*. One study has found that deficits in interpretive ToM ability negatively predicted Oppositional Defiant Disorder symptoms, and this relationship was mediated and moderated by the child's sympathy score (Dinolfo & Malti, 2013). The complex reasoning about the mind might enable the child to understand the multiple consequences of their behavior, and

their effects on another person, inspiring them in choosing different, more benign responses (Dinolfo & Malti, 2013), helping them navigate social tensions and situations (Ross et al., 2005).

1.2.2. Emotional Individual Differences – Anxiety

Deficits in earlier forms of ToM have been consistently found in autism (Charman, 2000), as well social anxiety (Washburn et al., 2016). *Anxiety* is a response to perceived threats, either being symbolic, psychological or social, and from an evolutionary perspective, it has a protective value (Mathews & Mackintosh, 1998). One paramount information processing bias in anxiety is the interpretive bias (Macleod et al., 2004), the tendency to interpret ambiguous stimuli as having the potential of being injurious (Clark & Beck, 2011). The first studies on childhood found a tendency in high-anxious 9-10 year-olds to interpret ambiguous or non-hostile scenarios as threatening (Bell-Dolan, 1995), or ambiguous homophones as threatening (Hadwin et al., 1997).

1.2.3. Anxiety, Interpretive Bias and ToM

Field and Lester (2010) proposed three possible models on the roles different developmental factors play in the generation and maintenance of the interpretative bias, *the integral, moderation and acquisition model* (Field & Lester, 2010a). *The acquisition model* and the *associative learning paradigm* (Alfano et al., 2002; Field & Lester, 2010b) posits that the interpretative bias is build up upon associations mediated by superior cognitive processes, such as ToM (Field & Lester, 2010b). Indeed, there has been some support in this direction (Grist & Field, 2012). Researchers have discussed other two approaches, *the advanced socio-cognitive theory*, as well as *the deficit socio-cognitive theory*. There is extensive support for *ToM impairments* in autism spectrum disorder (Baron-Cohen et al., 1999), as well as anxiety, especially in adult population (Plana et al., 2014), as well as children (Colonnesi et al., 2017). The negative relation between ToM and anxiety may be explained by the fact that struggles with inferring other's mental representations, their intention behind a behavior, or emotional expression, makes the interaction ambiguous, unpredictable, and hence, uncertain and possibly threatening (Colonnesi et al., 2017).

1.2.4. Cognitive Individual Differences - Executive Functions

Executive functions is an umbrella term that refers to deliberate, top-down neurocognitive processes, such as inhibition, working memory (WM), and shifting, meant for self-regulation, and organizing and managing problem solving (Zelazo & Muller, 2011). It appears to be more of a unitary construct in younger children, but as they age, this construct umbrella becomes more

structurally distinct (Diamond et al., 2013); hence it makes more sense to investigate each component separately in relation to ToM (Lecce et al., 2017).

1.2.4.1.Executive Functions and ToM

The relationship between EF and ToM is inconclusive in middle childhood (Devine et al., 2016; Hughes, 1998). Inhibition and shifting/cognitive flexibility shows week or non-significant correlations in middle childhood (Ahmed & Miller, 2001; Lecce et al., 2017; Vetter et al., 2013). The most notable is the WM, showing a significant correlation with ToM in middle childhood, even after controlling for age and gender (Williams et al., 2016).

There are two important accounts on the role of EF in ToM, the emergence and the expression account (Moses, 2001). *The expression account* suggests that for an individual to pass ToM tasks, they first need to acquire EF abilities (Perner et al., 2010) and has some support (Moses, 2001). Nonetheless, much more support is found for the *emergence account*, which states that EF blocks are necessary to be in place, for this socio-cognitive ability to emerge. Developments in EF enable children to engage in the very experiences that can set off ToM development (even further), such as analyzing and reflecting upon oneself and others mental states and behavior, as well as the discrepancy between someone's beliefs and reality (Sabbagh et al., 2006). There is support for this account from *cross-cultural studies* (Sabbagh et al., 2006), *EF task demands manipulation* (Wellman et al., 2001), *cross-sectional and longitudinal studies* (Duh et al., 2016) and *training studies* (Lecce et al., 2018). The only studies on the relation *between EF and interpretive diversity understanding* found both verbal WM and inhibitory control to predict performance on a modified interpretive ToM task in a group of 4 to 11 years old (Kennedy et al., 2015), and in another group of 4 to 10 year olds children (Lagattuta et al., 2010). Their relationship may shift across development, EF contributing to ToM emergence in early preschool years, then turning into an aid in their expression (Devine et al., 2016).

1.2.5. Context Correlates - Parental Practices

Parental rearing practices represent all the parental behaviors employed for the child's upbringing, and they define the emotional climate during the child's development (Darling & Steinberg, 1993), and it is linked to child developmental outcomes, such as externalizing and internalizing behaviors (Muris et al., 2003). Parental behaviors can be defined by three broad domains - Emotional Warmth, Rejection, and Overprotection (Aluja et al., 2006). *Emotional Warmth* rearing behaviors are marked by care, affection and acceptance towards their offspring,

or their well-being (Alegre et al., 2014), and predict the children's social development (Davidov & Grusec, 2006), and are negatively associated with internalizing symptoms (Gardner & Zimmer-Gembeck, 2018; Ge et al. 1996).

Parental control refers to controlling parenting behaviors, which limit the child's life and autonomy (Bögels et al. 2006), and is related with poor problem-solving and adaptive skills in children (Bögels et al., 2006), making them vulnerable to developing internalizing and externalizing problems (Muris et al., 2003). *Parental rejection* encompass behaviors that are laden in negative affect, such as rejection, criticism, disapproval, blame, punishment (Rapee, 1997), and lead, again, to a personal belief on a lack of personal control, which consequently would elevate their internalizing (Rapee, 1997), as well as externalizing symptoms (Brumariu & Kerns, 2010). Researchers argued that maybe parental actions have differential effect on the child's behavior across the life span (Connell & Goodman, 2002).

1.2.5.1.Parental Practices and ToM

The family relationship influence ToM development from an early age (for a review see Pavarini et al., 2013). Parenting styles characterized by obedience and strict adherence to rules seem to be negatively associated with ToM performance, while parenting styles characterized by discipline delivered with warmth are positively associated with ToM (O'Reilly & Peterson, 2014).

Up to date, only one study looked at the relationship between interpretive diversity understanding and parental practices. One of them found that the frequency of mother-child talks and mother's conceptions of knowledge were positively correlated with children's performance on the Droodle Task (interpretive ToM; Tafreshi & Rareshi, 2016).

1.2.5.2.Parental Practices and Child's Anxiety

Different parental practices have specific effect on children's externalizing and internalizing problems (Dadds, 2002). For example, not only the parenting style can elevate anxiety symptoms, but also the child's temperament marked by high levels of arousal can cause a controlling behavior in a parent aimed at reducing and preventing the child's distress (Bögels & Brechman-Toussaint, 2006). The parent may intervene in the situation where the child is feeling anxious in order to alleviate their distress, which only deepens their perception of lack of control, which in turn increases their anxiety even more (Hudson et al., 2008).

1.2.6. ToM at the intersection between Individual and Contextual Correlates

Psychopathology research nuances our comprehension on these constructs' relationship. For example, a sample of preschool children with ASD showed an impaired ToM while EF were unaffected (Pellicano, 2007). Additionally, there is great support for a deficit in WM (Eysenck & Calvo, 1992), inhibition (Derakshan et al., 2009) and cognitive flexibility, in *anxious individuals*. Increased anxiety symptoms may deplete resources necessary to hold your information and acknowledge the other's ignorance (Eysenck & Calvo, 1992). In a middle childhood group of children, cognitive flexibility was strongly related to second-order belief tasks and emotion-recognition tasks (Bock et al., 2015). As children's anxiety symptoms increased, they inferred fewer (nonthreatening) interpretations for the other character in a format that is different from the ones they gave. They seem to be somehow stuck in a threatening perspective, as if their cognitive flexibility is impaired (Moldovan & Visu-Petra, 2022).

In the quest of determining which variables are contributing to the individual's differences on ToM performance, *language skill* was considered as one important correlate. The mental activity, such as beliefs, knowledge and their influence on behavior, is not observable to the eyes, hence it is intuitive to consider *language* as the means to comprehend it (Im-Bolter et al., 2016). Beyond the preschool years, this strong relationship may vary, as a function of the conceptual changes that ToM suffers across the years (Lecce et al., 2014).

1.3.Methodological Aspects

1.3.1. Interpretive ToM Assessments

The investigations targeting interpretive ToM have been assessed with *the restricted view paradigm* (Lalonde & Chandler, 2002) and the *biased social cognition vignettes* (Pillow, 1991). The restricted view paradigm primary version asks the child to infer the two puppets' interpretations on the same ambiguous situation/drawings (Lalonde & Chandler, 2002). The variations of the *Droodle task* concerns some changes to the naïve attribution of the puppets, making them biased observers instead, through repetition of exposure to similar drawings (Barquero et al., 2003). If the child can understand that different beliefs on an ambiguous situation are possible, can the child also reason why a specific belief should be assigned to an individual. This nuance is further explored in a more complex task developed by Pillow (1991), which represents an assessment of *biased social cognition understanding*.

Following studies extended the literature in this direction by introducing the child to essential prior information about the individuals which witness an ambiguous action done by an actor (e.g., Pillow, 1991). They are concerned with children's realization, not only of a difference, but also of what kind of difference is appropriate for a particular individual (Miller, 200; Pillow, 1991). Children of 7-8 years of age seemed to appreciate these biases as more important than kindergartners when inferring the individuals' interpretations of the ambiguous situation done by the actor, and used them when justifying their answers.

1.3.2. Constructivist ToM Assessments

Constructivist ToM is gtounded in research on children's understanding of knowledge. Weimer and colleagues (2021) have developed an interview, the Constructivist Theory of Mind Interview, in a short and long version, containing scenarios (6 for the short version and 10 for the long version) in which one or two persons are presented with stimuli of various nature (visual, auditory, or verbal). Children answer questions regarding the person(s)/s'(s) mental processes (Comprehension, Attention, Memory, Comparison, Planning, and Inference) that are involved in the processing of those stimuli. The questions investigate whether children understand interpretative diversity and if they reason this to be a result of the constructive nature of mental processes or other external factors. Around the age of 11 years old, there is a significant shift from evaluating the mental processes as more important to external aspects (Weimer et. al., 2017).

1.4.Theoretical Models Accounts

We will examine the most relevant models to our research questions on interpretive diversity understanding, and, based on the presented information we will end this chapter with a proposed integrative model.

1.4.1. The Active-Passive Hypothesis and the Three Levels of Conceptual Understanding of Mental Activities

Over the years, children gradually turn to a more fine-grained understanding of knowledge and beliefs and see that psychological processes (prior knowledge, beliefs) mediate the experience of external events. In other words, we witness *a change from a theory about the knowledge that reflects or copies the objective events, to a more subject-oriented, or constructivist epistemology* (Carpendale & Chandler, 1996). This change from a passive to an active perspective of the mind is reflected in children's interpretive (Lalonde & Chandler, 2002) and constructivist ToM (Weimer et al., 2017).

Pillow (1998) describes two rudimentary forms of understanding this mediated relationship, namely the understanding of mediation by a prior internal state (such as a desire, belief or expectation; interpretive ToM), as well as the understanding of psychological selection (e.g., selective attention, selective recall, and evaluative selection; Pillow, 1998). Analyzing this mental process, selection, in terms of categories, as well as a relevant factor in belief construction, is analogous to Weimer and colleagues' (2017) discussion on belief construction as a function of how the mental capacities are employed (constructivist ToM).

Pillow (2008) expands this discussion when presenting a categorization of conceptual understanding of cognitive activities in *three main domains: the occurrence knowledge* (knowledge that particular cognitive activities occur), *organizational knowledge* (knowledge of relations among cognitive activities) *and epistemological thought* (reflection on the nature of knowledge and relation between knowledge and reality). The first aspect, the *occurrence knowledge*, refers also to children's understanding of interpretive inferences on ambiguous content (Carpendale & Chandler, 1996; Pillow, 2008). Preschoolers and some first graders have difficulties in understanding that two individuals could interpret ambiguous stimuli differently, while second graders do not (Carpendale & Chandler, 1996; Lalonde & Chandler, 2002).

According to Pillow (2008), as children improve their understanding of cognitive processes, they are more and more able to engage in abstract reasoning about these mental activities, to reflect, compare and organize them (*organizational knowledge)*. This will lay the foundation for constructivist ToM research. Pillow's (2008) discussion on the categorization of conceptual understanding gives us a preliminary understanding of how the interpretive and constructivist ToM are related.

1.4.2. Integrative Model of ToM in Middle Childhood by Weimer and Colleagues (2021)

Weimer and colleagues (2021) developed a dynamic developmental framework of advanced ToM by integrating the literature on the antecedents, correlates and consequences of ToM, in social, behavioral, cognitive, as well as neural domains, and formulating hypothesis for future research. These relationships are expected to be bidirectional in nature. Given the variability in findings, authors hypothesize the indirect nature of these relationships as follows: firstly, the relation between ToM and social behavior is thought to be mediated and moderated by various factors, such as aggression assessed, social context, and the child's social cognitive and emotional development. Secondly, they put forth the hypothesis according to which ToM mediates the

relationship between emotional regulation (which include executive functions) and social, as well as academic outcomes. The importance of examining other sociocultural, contextual and linguistic factors is also emphasized (e.g., parental practices; bilingualism), as they would influence the relationships described above.

1.4.3. Integrative Interpretive Diversity Understanding – Integrative Model

We want to propose a *complementary model to the framework portrayed by Weimer and colleagues (2021), in the sense that we focus on interpretive diversity understanding, an Advanced ToM, by integrating the existing findings on its relationship with various correlates*. The scarce literature suggests interpretive diversity understanding as a slightly incoherent umbrella of multi – processes, that can be, furthermore, analyzed as a multi - component ability (Miller, 2000; Schaafsma et al., 2015). Next, we describe the model's components and their relationships.

Interpretive ToM may be the first form of interpretive diversity understanding. It encompass various abilities, from the rudimentary one of recognizing the ambiguity of different stimuli as supporting various interpretations, to a more complex understanding of internal states as mediators on belief construction (Pillow, 1991; Pillow 1998). We propose that the two forms are defined as two interdependent types of interpretive diversity understanding, the *interpretive ToM - perceptual*, and the *interpretive biased ToM*, respectively. The knowledge on particular cognitive activities (occurrence knowledge; interpretive ToM) lays the foundation for the organizational knowledge, regarding the relation between different internal processes and content (constructivist ToM; Pillow, 1998). And this is reflected by the third type, *the constructivist ToM* (Weimer et al., 2017), which deals with children's understanding of active mental activities as part of belief construction, in other words, the underlying processes that support the mediation analysis understanding described for interpretive ToM. The differential results obtained in our studies with the two interpretive diversity understanding tasks support this differenciation. We hypothesize that these interpretive diversity understanding types influence each other.

Amongst the predecessors of Advanced ToM are the EF, 1st and 2nd order ToM, as well as language abilities (Weimer et al., 2021). Both EF and language abilities are umbrella terms that cover various abilities, each with separate relationship with ToM (e.g., Farrant et al., 2012). ToM has been extensively researched in relation with anxiety (e.g., Mazzone et al., 2007). We hypothesize that the socio-cognitive deficit is also expected in middle childhood, regarding the interpretive diversity understanding. More specifically, as interpretive diversity understanding is

less developed, children will find it harder to envision other possible interpretations, or consequences/outcomes for situations that are not threatening, causing anxiety symptoms to increase (e.g., Field & Lester, 2010).

Environmental factors are extremely relevant for ToM development. Both ToM and anxiety are greatly influenced by the multi - dimensional relationship between the child and their caregivers (Hughes & Devine, 2019; O'Reilly & Peterson, 2014). Warm behaviors are encouraging and offer different opportunities to discuss and understand the mind, while controlling and rejecting ones are blocking and stagnating the process of reasoning about beliefs and mental content (O'Reilly & Peterson, 2014). We hypothesize that ToM mediates the relationship between parental practices and anxiety symptoms. Interpretive diversity understanding may help children to discard anxious or rejecting parental messages, and to become increasingly more able to construct their own neutral belief system, and therefore, to develop into a healthy adulthood.

1.5.Conclusions and Implications

To conclude, the recent literature reviewed in this chapter pinpoints the importance of studying the development of advanced ToM, with the aim to elucidate the complex dimensions of abilities found under the umbrella of *interpretive diversity understanding*, and its relation with various emotional, cognitive factors, based on an integrative model. Given the indispensable role played by ToM in daily adaptation and social functioning, the aforementioned relationships need to be investigated in order to develop future interventions to improve this ability, such as conversation-based training (Lecce et al., 2014).

1.6.Thesis Overview and Research Questions

The main aim of this thesis was to explore the abilities encompassed under the umbrella of interpretive diversity understanding throughout middle childhood, and its relations to other cognitive, emotional and contextual correlates. In the four studies included in this thesis, we based our predictions on the *Weimer and colleagues (2021) model* and our proposed *integrative model*, by looking at how anxiety correlates (anxiety symptoms and interpretive bias), executive functioning and parental practices can be influential in interpretive diversity understanding development and expression. In light of this, we investigated whether: (1) executive functioning is an important pre – requisite of interpretive diversity understanding; (2) low levels of anxiety symptoms and interpretive bias are negativey associated with interpretive diversity understanding; (3) parental practices have a direct influence on interpretive diversity understanding, as a function

of their specificity; and (4) different types of interpretive diversity understanding have a bidirectional relationship.

CHAPTER 2

STUDY 1: ADVANCED THEORY OF MIND AND EXECUTIVE FUNCTIONS DURING MIDDLE CHILDHOOD[1]

2.1. Introduction

This ability to reason about the mind, to infer another individual's mental activity (e.g., beliefs, desires), to interpret and predict behavior appears at around the age of 4 years (Wellman et al., 2001). The contradicting findings in the literature indicate the possibility of a multi-process ToM during middle-childhood (Schaafsma et al., 2015).

Advanced ToM was approached in this study with three tasks that tap different aspects of it. The *Strange Stories (SS) task* measures the understanding that the emotional and behavioral reaction of an individual depend on how they interpret the messages communicated by another individual (Happé, 1994; White et al., 2009), and their capacity to reason in complex and realistic social situations as well (Devine & Hughes, 2013, 2016). *Faux-pas understanding* is also concerned with children's understanding of complex situations, in the sense of recognizing transgressions of social norms (Baron-Cohen et al., 1999). The third ability and of utmost interest for our study is *interpretive biased ToM*, also included under the interpretive diversity understanding umbrella (Millers, 2000). Over the years, children gradually understand that when confronted with the same situation, people can form different interpretations due to their own personal subjective experience, beliefs and attitudes, with which they come to the situation (Lalonde & Chandler, 2002). Developmental changes in ToM are influenced to a large degree by cognitive processes, and those of interest for this study are the executive functions (Carlson & Moises, 2001).

Executive functions (EF) encompass a variety of higher-order processes, such as inhibitory control, working memory (WM), and shifting, necessary in deployment of cognitive activities, such as planning, reasoning and problem solving (Diamond, 2013; Zelazo & Muller, 2011). These cognitive processes underlie emotional, thought and behavioral regulation (Diamond, 2013; Rueda

[1] Study 1 described in this chapter has been accepted with minor revisions in the *Studia Psychologia-Paedagogia*: Moldovan, Coman & Visu-Petra (2022).

et al., 2012). ToM emergence has been documented to heavily rely on EF in preeschool (Carlson & Moses, 2001; Devine & Hughes, 2014) and their relationship is unclear in middle childhood (Weimer et al., 2021).

The literature is inconclusive, with some studies stressing the unique role WM has in further advancements in mind reasoning (Lecce et al., 2017; Lecce et al., 2018), while others found attention shifting and WM updating to be correlates, as well as longitudinal predictors of ToM in middle childhood (Austin et al., 2014). On the other hand, others found only concurrent links between ToM and EF (Devine et al., 2016). Researchers emphasize the need to evaluate each EF ability separately in relation to ToM (Weimer et al., 2021). Differential results on the relation between EF and ToM might emerged as a function of task demands. For example, Im-Bolter and colleagues (2016) supported the joint contribution of shifting, updating and language abilities to SS performance in middle childhood, while for Faux-pas understanding, language, inhibition and reasoning seemed to be relevant (Menhardt-Injac et al., 2020). Others found inhibition and verbal WM to be associated with a better performance on an ambiguous drawings interpretive ToM task (Lagattuta et al., 2010). These results indicate the continuity in these abilities' development during middle childhood, as well as their complex interrelationships (Devine et al., 2016).

Among individual differences that are of significant value when it comes to ToM variability, we can also add comprehension ability, as well as the emotional dimension (Weimer et al., 2021). There is vast support for a deficit in ToM for children with anxiety (Plana et al., 2014), for a variety of symptoms, from panic and separation anxiety (Caputi & Schoenborn, 2018), to social anxiety (Öztürk et al., 2020). Regarding interpretive ToM, in a group of 9-11 years old children, as their anxiety symptoms and number of threatening interpretations of an ambiguous situation increased, their ability to understand that two people can form two different interpretations on the same ambiguous action was lower (Moldovan & Visu-Petra, 2022; Chapter 3, the current thesis).

Current Study

The main aim of our study was to broaden the limited knowledge on advanced ToM abilities and their relationships with a multidimensional view of EF, by using three ToM measures that have not been investigated together before, while also considering its interrelations with a broader emotional framework (anxiety). We focused on middle childhood, as results throughout this age frame are inconclusive (Weimer et al., 2021). We intend to analyze each ability

individually, as well as together. Hence, we also computed their sum into a Total ToM score, and used it in the subsequent analyses. Firstly, we anticipated that the three ToM measures would positively correlate. Secondly, we hypothesized that each EF would positively predict ToM abilities, as well as the Total ToM. Secondly, we hypothesized that children's anxiety symptoms would be negatively related with each ToM, as well as the Total ToM performance, according to the deficit hypothesis.

2.2. Method

Participants and Procedure

We recruited 120 primary school children with ages between 9-12 years (M = 124.02 months, SD = 12.23). 80% declared their household earnings above minimum wage. Their parent's education varied, most of them having finished a bachelor degree (56% of mothers).

Firstly, parents completed the demographic, as well as the parental version of child anxiety questionnaires. Afterwards, an experimenter tested children with the ToM and IQ tests, individually, online using Zoom or Google meet platforms, all in one session. We counterbalanced the order of the tasks during children's evaluation phase.

Measures

Comprehension test. We used a 21-item subtest from the Verbal Comprehension Index, from the Romanian adaptation of the WISC-IV (Dobrean 2012; Wechlser, 2004), and was applied to evaluate their ability to understand complex social questions and answer them accordingly.

The Revised Child Anxiety and Depression Scale-Parent Versions (RCADS). RCADS (Visu-Petra et al., 2011; Chorpita et al., 2000) is a 47-item questionnaire used to measure the frequency of the most relevant anxiety symptoms (the Anxiety Subscales are: Generalized Anxiety Disorder Subscale, Social Phobia Subscale, Separation Anxiety Subscale, Panic Disorder Subscale, Obsessive-Compulsive Disorder Subscale, 37 items) and Depression (10 items for Depression Subscale), as indicated by DSM-IV. Responses range from 0 to 3 (0 - *never*, 1 - *sometimes*, 2 - *often*, 3 - *always*). Both caregiver's and children's versions were administered. The RCADS had high internal consistency with α = .91.

Listening Span.The experimenter presented sentences and the child answered if they were true or false, providing a yes/no answer, and, at the end of the trial, they are required to recall the last word from each sentence. The series of short sentences become increasingly longer, and six trials

were included for each list length. An aggregated span score was computed for each child, following the procedure described by Cowan and collaborators (2003).

Inhibition and Switching. We used a task included in the NEPSY-II battery (Korkman et al., 2007), that represents a comprehensive neuropsychological assessment for middle school children. The subtest administered had three sections - naming, inhibition, and switching, each assessing the respective skills. The first one regarded the naming of specific forms, while the second one evaluated the ability to inhibit automatic incorrect response in favor of correct responses, and the last one examined the ability switch between response types. For each correct response children received a score of 1 (maximum score is 80). We divided the total completion time per accuracy for each condition to obtain the inhibition efficiency per condition, and then we calculated the mean of the resulted two coefficients to obtain the Inhibition efficiency. The same was done for the Switching efficiency.

Strange Stories. This task measures the understanding that the way an individual interprets a communicated message will influence their emotional and behavioral reaction. It consists of vignettes (one double bluff, a white lie, a deception and a misunderstanding story) depicting realistic social situations, each followed by a single question in an open format regarding the understanding of the character's intention and motive (White et al., 2009). The responses were coded with 0 - failed understanding, 1 - partial understanding and 2 – full understanding of the characters' mental states. The total score could vary between 0 and 8. Based on 25 % of the responses, the interrater reliability was very high (Cohen's kappa = .90).

Faux-pas task. This task measured children's understanding of complex situations, in which transgressions of social norms have occurred. The experimenter read 4 stories to the child and, after each one, asked 4 questions to evaluate children's understanding of the faux-pas (Baron-Cohen et al., 1991). Only if the child answered correctly to all the 4 questions, the story was scored with 1, otherwise, it was scored with 0. The total score of one child could vary between 0 and 4. Based on 25 % of the responses, the interrater reliability was very high (Cohen's kappa = .91).

Interpretive Biased ToM (adapted from Pillow, 1991; Pillow & Weed, 1995). We adapted 4 stories from Pillow (1991) and Pillow and Weed (1995). The stories had one character and an actor. The character had two biased beliefs about the actor, one of which was relevant for the situation. The actor engages in an action, that remains ambiguous to the character, but not to the

child. We intersected two conditions, *nature of ambiguity and contrasting valences (*Pillow & Weed, 1995).

Firstly, the nature of the *ambiguous action* could be of one of two types: either the action had an ambiguous intention (intended or accidental) or the identity of the action was ambiguous (action identification condition). We had two stories in each of these two conditions. Secondly, the character's *relevant biased belief* and disambiguating information were either of contradicting valences or not. The experimenter asked a bias memory question, an event memory question, an access to knowledge question, and an interpretation question. The order of choices in the last question was counterbalanced.

The interpretation question targeted the character's interpretation of the actor's action, and a correct answer would require a consideration of the character's prior experience (biased belief) with the actor. If the child answered correctly to all of the questions, the story was scored with 1, hence the total score varied between 0 and 4. Based on 25 % of the responses, the interrater reliability was very high (Cohen's kappa = .92). We calculated the sum of the three ToM tasks and used it in the subsequent analysis, following Austin and colab. (2014) procedure.

2.3. Results

The normality of each distribution was examined in order to choose between the parametrical or non-parametrical tests. Regarding the demographic data, we obtained a positive correlation between Total ToM and Age, $r_s(120) = .24$, $p = .006$, as well as Income, $r_s(120) = .24$, $p = .006$. This means that children performed better on the ToM tasks, they were also older and their parents had a higher financial status. We failed to support the first hypothesis, as the three ToM tasks did not correlate with each other. However, when we looked at the valence consistency condition separately, we found a positive correlation between valence consistent stories and faux-pas performance, $r_s(120) = .25$, $p = .005$, as well as between performance on valence inconsistent stories and switching performance, $r_s(120) = .19$, $p = .033$. However, the correlations became insignificant after controlling for Age.

We obtained positive correlations between Total ToM and Comprehension, $r_s(120) = .28$, $p = .002$, as well as WM, $r_s(120) = .24$, $p = .007$. We also found significant correlations between Inhibition/Switching Efficiency, and Comprehension, $r_s(120) = -.27$, $p = .003$, and $r_s(120) = -.26$, $p = .003$. Regarding the relation to ToM tasks, we found a significant correlation between

Inhibition/Switching Efficiency and Strange Stories performance, $r_s(120) = -.19$, $p = .037$, and $r_s(120) = -.18$, $p = .041$.

In order to determine the specific effect of EF on Total ToM, we ran hierarchical regressions using the bootstrap method, which is recommended when the dependent variables violate the assumption of normality. We included as the dependent variable the Total ToM score. The control variables were Age and Income. In the second step, we included WM and Comprehension. The first model was significant, and explained 10% of the variance, $R^2 = .10$, $F(2, 117) = 6.980$, $p < .001$. The second model was also significant, and predicted 14,8% of the variance, $R^2 = .04$, $F(4, 115) = 4.975$, $p < .001$. In the second model, only Comprehension remained significant, $\beta = .074$, $p = .042$, *CI* [.002; .146].

2.5. Discussion

The lack of correlations surprising, as ToM has been argued to be a non-coherent construct, with mixed results across studies, especially in those conducted with middle childhood populations (Meinhardt-Injac et al., 2020; Schaafsma et al., 2015). However, when we looked separately at the interpretive biased ToM conditions pertaining to the contrasting bias-reality valence, we found a positive correlation between performance on valence inconsistency condition and faux-pas understanding, and between performance on valence consistency condition and Switching Index, although they were insignificant once the age was taken into account.

We followed Schaafsma and colab. (2015) suggestions to deconstruct ToM into simpler processes. The child must consider the content of the biases in order to determine which one is relevant for the presented situation (Pillow & Weed, 1995). They must imagine two possible scenarios, based on these biases, and contrast them with the details of story, in order to infer the correct interpretation.

With regards to the role EF have in ToM variance, we have found WM and Comprehension to be positively associated with Total ToM, but only Comprehension was a significant predictor. These results are in line with other studies that found WM to be associated with a Total ToM score at 6-11 years, as well at 7-12 years (Austin et al., 2014). The lack of other associations are in line with other studies during school years (Bianco et al., 2019; Lecce et al., 2017). The relationship between EF, language and advanced ToM is inconclusive, and varies greatly as a function of task used or the subprocess measured (Ahmed & Miller, 2011; Weimer et al., 2021).

CHAPTER 3

STUDY 2: THEORY OF MIND, ANXIETY SYMPTOMS AND INTERPRETIVE BIAS DURING MIDDLE CHILDHOOD[2]

3.1. Introduction

Highly anxious individuals have a hypersensitive "alarm system" to danger that affects the way they process information (Clark & Beck, 2010). The tendency to respond to ambiguous stimuli from the environment with thoughts about possible physical or mental harm is known as *interpretive bias* (Clark & Beck, 2010). As proposed by the selective processing model, for highly anxious individuals, the negative interpretation will have priority when it comes to awareness level, due to its higher activation (Mathews & Mackintosh, 1998). The interpretive bias has been consistently identified in 7-to 11-year-olds (Hadwin & Field, 2010). Even though it is still unclear what socio-cognitive factors contribute to the interpretive bias development and maintenance, ToM has been debated as a potential predictor (Field & Lester, 2010a).

Children gradually understand that people can generate diverse interpretations of the same situation, due to their differences in prior beliefs and attitudes, not only due to differences in knowledge, and this is called *constructive* or *interpretive ToM* (Carpendale & Chandler, 1996; Lalonde & Chandler, 2002; Pillow & Mash, 1998). Over the years, children also start considering past expectations to be relevant when constructing a different interpretation of an ambiguous situation (Barquero et al., 2003). The understanding of biased social cognition is an important aspect of interpretive ToM (Millls, 2000). Between 6 and 8 years of age, children understand that an observer's expectation and prior beliefs influence their interpretation of another person's behavior, this understanding being more difficult than recognizing false beliefs (Behbahani et al., 2012; Pillow, 1991). Existing research indicates that interpretive biased ToM continues to develop even after the age of 13 (Kennedy et al., 2015; Ross et al., 2005).

ToM is considered to be indispensable in growing into a socially competent individual (Sodian & Kristen, 2010), and researchers have argued that it could be an early socio-cognitive factor related to anxiety and its manifestations (Field & Lester, 2010a, 2010b). The *associative learning paradigm* (Alfano et al., 2002) discusses the superior cognitive processes as building

[2] Study 1 described in this chapter has been published in the Moldovan & Visu-Petra (2022). Minding the Monster under the Bed: Theory of Mind, Anxiety Symptoms and Interpretive Bias during Middle Childhood. *Journal of Child and Family Studies, 31*(1), 99-113. https://doi.org/10.1007/s10826-021-02023-0.

stones for interpretive bias. The authors conjecture that the child needs to understand ambiguity with its multiple possible realities, before making an actual association between ambiguity and threat, and one ability that helps them understand ambiguity is ToM (Field & Lester, 2010a, 2010b). Grist and Field (2012) found in a sample of preschoolers that ToM mediated the relation between age and their ability to elaborate on potentially negative outcomes. Understanding that beliefs and desires can influence actions lay the foundation for the child to visualize diverse scenarios, and worry about negative outcomes (Grist & Field, 2012). This line of evidence would suggest a positive correlation between children's (interpretive biased) ToM and the presence of an anxiety-related interpretive bias.

However, the idea that interpretive bias will develop after children have acquired (interpretive biased) ToM relies on the premise that children require an explicit understanding of a mental process in order to engage in one (Field & Lester, 2010a), an assumption that was not supported by existing empirical results (Jakubowska & Białecka-Pikul, 2020). More often, the explicit understanding comes after we engage in a given action or mental process and reflect upon it (Reddy, 2007). Children might learn from significant ones (parents or relatives) to negatively react to an ambiguous event, simply by imitating emotional manifestations (Creswell & O'Connor, 2006; Lester et al., 2010).

A second approach proposes that the ToM deficit hypothesis in anxiety, meaning people with difficulties in reasoning about the other's mind might find various situations confusing, elevating their anxiety symptoms (Buhlmann et al., 2015). For example, anxious children showed difficulties in appreciating the complex emotional consequences of a faux-pas mistake (Banerjee & Henderson, 2001), or had lower ToM performance (but only when they tended to express shyness in a non-adaptive way; Colonnesi et al., 2017).

The developmental interplay between ToM, interpretive bias and anxiety is not fully elucidated. Given the preliminary empirical evidence suggesting that mentalizing skills are not necessary in order for the interpretive bias to emerge (Colonnesi et al., 2017), we favor the deficit hypothesis and aimed to test it in a series of novel scenarios for middle childhood.

Current Study

Our main focus in the current paper is to provide preliminary evidence regarding the interrelations between (interpretive biased) ToM, interpretive bias, and anxiety symptoms in a group of children aged between 9 and 11 years, for the first time in literature. We used an indirect

measure of ToM, namely the ToM Inventory for parents (Hutchins et al., 2012).We adapted Pillow's (1991) task in which children were asked to infer the perspective of a biased observe. We modified this task according to our objectives to relate it to potential anxiety-provoking scenarios. The resulting novel task, The Multiple Interpretation Task (MIT) followed the The Bias Task measuring the tendency to generate negative interpretations (Suarez & Bell-Dolan, 2001).

We expected that the interpretive bias would be positively associated with anxiety symptoms, as shown by the existing literature to date (see Stuijfzand et al., 2018, for a recent meta-analysis). Based on the anxiety-related ToM deficit hypothesis (Colonnesi et al., 2017), children with lower (interpretive biased) ToM would be more prone to see the ambiguous situations as unpredictable and confusing, hence leaving room for negative interpretations (Nikolić et al., 2019). In this case, we would expect ToM proficiency to be negatively correlated with both interpretive bias and anxiety symptoms.

3.2. Method

Participants and Procedure

We included in this study 86 primary school children (33 girls) with ages between 9 and 11 years (M = 10 years, SD = 7.01, Mdn = 10.12 years). Varied in their household earnings and maternal/paternal education levels also differed, with 28.4% completed an undergraduate degree.

In the first phase, parents completed the Revised Child and Depression Scale - parent version and Theory of Mind Inventory. Afterwards, children were administered the child version of the first questionnaire during school hours. In the last phase, which lasted for about 30 min, children were read the vignettes and addressed the questions individually by an experimenter in the counselor office.

Measures

The Revised Child Anxiety and Depression Scale-Parent and Child Versions (RCADS). RCADS (Visu-Petra et al., 2011; Chorpita et al., 2000) is a 47-item questionnaire used to measure the frequency of the most relevant anxiety symptoms. Both caregiver's and children's versions were administered. The RCADS for parents has high internal consistency (α = .88), as well as RCADS for children (α = .93).

Bias Task (modified from Creswell & O`Connor, 2006). Participants were read 4 scenarios in which an actor performed an ambiguous action directed towards the child. In each one, we asked the child for an interpretation, both in a free and closed response format. We scored the response

with 1 if it was threatening, or 0 if it was nonthreatening. The task's internal consistency was relatively low, of $\alpha = .61$, which was taken into account as a cautionary note when interpreting the results.

Multiple Interpretation Task. 4 vignettes (adapted from Pillow, 1991), each accompanied by illustrations were developed according to three main principles: the definition of the interpretive biased ToM, the valence of the biased belief and the presence/absence of disambiguating knowledge (Pillow, 1991). Each Bias Task scenario (see description above) was followed by a MIT vignette with the same actor/s (e.g., a group of children) who performed an ambiguous action. The difference is that the actor's action in the MIT vignette was directed towards another character, not towards the child, as it was previously depicted in the Bias task. Beside the actor, we introduced a character that had a pre-existing positive or negative biased belief (valence) towards the actor. The pre-existing biased belief was described as a more general attitude, of threatening or nonthreatening valence. The second "character" was the child themselves, and we had already extracted their biased belief from the Bias Task.

The second aspect regarded the *valence of the biased belief*. In order to ensure that children actually considered the content of the character's biased belief in inferring the interpretation and not just applied their own biased belief to their character, in 2 out of 4 vignettes, the child's bias (derived from the Bias task) matched in valence to the character's biased belief (Contrasting Knowledge, CK), whereas in the other two vignettes it wasn't (Contrasting Biases, CB). Therefore, we prepared two different versions for each vignette of the MIT beforehand, one in which the character's biased belief is threatening, and one in which is nonthreatening, so that we can make a choice based on the child's response in the Bias Task (Chosen Response).

The third aspect concerned the *knowledge regarding the ambiguous situation*. In the 2 CK Vignettes, the child also received information that disambiguated the action (knowledge). The ones in which they did receive the disambiguating information (CK), the child was made aware that the character did not have access to the disambiguating information, only the child did. Moreover, the disambiguating information was of contrasting valence to the character's biased belief and child's bias. This allowed us to also test for the child's egocentric attributions, which represent a tendency to attribute their own knowledge to an ignorant person (Pillow, 1991). After being read the stories and shown the pictures the child was asked about: 1) the character's interpretation of the actors' ambiguous behavior ("What does Anna think is happening?") and their

justification ("Why does Ana think that?"); 2) the child's own interpretation of the actors' ambiguous behavior, followed by their own justification.

In the CK Version regarding the character's interpretation (CK), if the interpretation was congruent with the specified character's biased belief with respect to valence (nonthreatening / threatening), the answer was categorized as correct. If it had the opposite valence, or it was just a description of the situation, it was considered an incorrect answer (Pillow, 1991; Pillow & Weed, 1995). For the character's justification (CK), if the child justified the character's interpretation using the character's prior biased belief or its past experience ("She thinks that they are playful like her former colleagues."), it showed that the child reasoned that an interpretation can be influenced by the observer initial biased belief and it was categorized as a correct response. Hence, each child could have a score of 0, 1, or 2 correct responses for the character's interpretation and justification questions in the CK Version. As for the child's interpretation (CK), if it had the same valence, nonthreatening or threatening, as the valence of the information the child had access to (e.g., "They are mocking her") it was considered a correct response. Hence, each child could have a score of 0, 1, or 2 correct responses for the child's interpretation and justification questions in the CK Version.

In the CB Version, for the character's interpretation (CB) and justification (CB), the criteria were the same. The child's interpretation and justification response on the ambiguous act were analyzed on two dimensions, similarity/dissimilarity (to the character's interpretation or justification, with respect to content) and valence, nonthreatening or threatening (4 categories that were based on the combination of these 2 characteristics). Hence, each child could have a score of 0, 1, or 2 for each category of interpretation and justification. The children's responses were reliably rated by two independent raters (Cohen's kappa = 0.75).

Theory of Mind Inventory-1. The inventory for ToM (Hutchins et al., 2012), comprised of 43 sentences, was used as an indirect measure for this social-cognitive ability. Three Subscales were obtained: the Early ToM Subscale, the Basic ToM Subscale, and the Advanced ToM Subscale. Higher scores on a Subscale suggest higher confidence that their children have acquired the abilities evaluated in the respective ToM Subscale. The internal consistency coefficient is acceptable at $\alpha = .74$.

3.3. Results

Regarding the Bias Task, almost half of children, 43%, answered with a threatening interpretation to the Free Response on one trial, while 39.5% maintained the same response across two trials. A Kolmogorov-Smirnov test was used to test for the normality for all variables (e.g., for Anxiety Score Child, $D(85) = .1$, $p = .021$), and we further used non-parametric tests. Therelation between the child and parent reports was moderate for the Anxiety Score: $r_s(82) = .31$, $p = .004$; as well as for the Internalizing Score (Anxiety + Depression Subscales), $r_s(83) = .358$, $p = .00$. Due to the moderate correlation, we opted to further use in our analysis the children's report. The Spearman rank-order correlation was conducted to test for age associations, and we found no significant correlation. Subscales from the ToM Inventory were highly correlated. Also, only the Basic ToM Subscale had a significant positive correlation with age, $r_s(81) = .22$, $p = .04$, which means that as age increased their reported basic ToM abilities increased.

We obtained significant positive correlations between the Anxiety Score and interpretive bias (Free Response), $r_s(85) = .23$, $p = .03$. Hence, we found preliminary support for our first hypothesis. We found a significant negative correlation between both Anxiety Scores and ToM abilities (i.e. between Anxiety Score and Advanced ToM Subscale $r_s(85) = -.37$, $p < .001$). In line with the other findings of this study, we found that the Advanced ToM Subscale and the Bias Task, $r_s(86) = -.25$, $p = .017$.

We aimed to investigate the differences in anxiety scores and interpretive bias scores, between children with different accuracy levels on the Multiple Interpretation Task (number of correct answers could be 0, 1, or 2 per question type/Version). The Kruskal-Wallis test showed that there was a statistically significant difference between children who gave a different number of correct responses (0, 1 or 2) for the justification question of the character (CK) in terms of their anxiety symptoms, $H(2) = 6.611$, $p = .037$. For the Anxiety Score, there was a mean rank of 48.07 for 0 correct response, 32.75 for 1 correct response, and 39 for 2 correct responses, in using the interpretive biased ToM. A post-hoc Mann-Whitney test was further used to determine which groups were significantly different. The differences in the Anxiety Score between those that had 0 responses and those with 1 response was significant, $U(N_{\text{oresponse}} = 54, N_{1\text{response}} = 24) = 423.5$, $z = -2.4$, $p = .015$. This means that children with 0 correct responses in using the character's biased belief to justify the character's interpretation (interpretive biased ToM) had higher anxiety symptoms than those that gave 1 correct response .

The Kruskal-Wallis test showed that there was a statistically significant difference in terms of interpretive bias between children with a different number of correct responses for the character interpretation (CB), $H(2) = 8.765$, $p = .012$, with a mean rank of 77.63 for 0 correct responses, 42.39 for 1 correct response, and 41.62 for 2 correct responses in using the interpretive biased ToM. The post-hoc Mann-Whitney test using a Bonferroni-adjusted alpha level of 0.017 (0.05/3) was used to compare all group pairs. The differences in the threatening interpretations between those who had 0 and 1 correct responses were significant, $U(N_{0\text{response}} = 4, N_{1\text{response}} = 23) = 10.5$, $z = -2.52$, $p = .018$. The differences in the threatening interpretations between those who had 0 and 2 correct responses were significant, $U(N_{0\text{response}} = 4, N_{2\text{responses}} = 59) = 17$, $z = -3$, $p = .01$. This means that children who correctly used the character's biased belief to construct the character's interpretation of the ambiguous situation (an indicator of higher interpretive biased ToM) in one or both trials gave fewer threatening interpretations on the Bias Task than those who did not use at all this biased belief (an indicator of interpretive biased ToM).

In order to test the convergence between the two interpretive/advanced ToM measures, we contrasted scores on the parental reported ToM abilities (Advanced ToM Subscale) between children who gave either 0, 1 or 2 responses to the child interpretation question (CB) in the IntDissimilar_T type of response. The Kruskal-Wallis test showed a significant difference between these subgroups, $H(2) = 6.311$, $p = .04$. There was a mean rank of 45.74 for 0 response, 28.92 for 1 response, and 72 for 2 responses. The post-hoc Mann-Whitney test showed that a significant difference in the Advanced ToM Subscale between those who had 0 and 1 response, $U(N_{0\text{response}} = 72, N_{1\text{response}} = 13) = 284$, $z = -2.247$, $p = .025$. This means the children who constructed one different interpretation from the one constructed for the character, and specifically one with a threatening value, were reported by their parents as having more advanced ToM abilities than those who did not. Moreover, the Mann-Whitney test showed significant differences between scores in the Basic ToM Subscale, between children who had 0 and 1 response for the child justification question (CB) categorized as being a JustDissimilar_T, $U(N_{0\text{response}} = 64, N_{1\text{response}} = 19) = 368$, $z = -2.605$, $p = .009$. In other words, the children who constructed a different justification for themselves that also had a threatening value were reported by their parents as having higher basic ToM abilities than those who did not.

3.4. Discussion

Our first hypothesis was supported by finding a positive association between interpretive bias and anxiety. This is in line with the selective processing model that considers the interpretive bias as a core process in anxiety due to the fact that the threatening interpretation of ambiguous stimuli is more easily activated in our cognitive system (Clark & Beck, 2011; Mathews & Mackintosh, 1998). Acknowledging the small magnitude of our correlations, as well as the Bias Task's low internal consistency, we take these results as preliminary evidence in confirming this relationship in the 9-to 11-year-olds age group.

Our results partly confirmed the ToM deficit hypothesis in relation to anxiety symptoms by identifying a negative relationship between parental reports of children's mentalizing abilities and children's anxiety dimensions. As a cautionary note, it is important to keep in mind that the correlations' magnitude was fairly small. However, these modest results corroborate with the negative trend observed when looking at our novel adapted task. On the novel Multiple Interpretation Task, across both versions (CK and CB), children who appreciated more often the character's biased belief as relevant in constructing the character's interpretation of the ambiguous situation (an indicator of interpretive biased ToM), and justified it accordingly had lower anxiety symptoms, as well as lower scores on the interpretive bias task, than those who did not. This was also valid for the children who used the disambiguating information more often when constructing their interpretation of the situation. This reflects an increased cognitive flexibility, as children with lower anxiety seemed to offer a better reasoning that a person's belief system may be more important than other external factors for their interpretation on a potentially anxious ambiguous situation.

For the first time in the literature, we refuted the Field and Lester's (2010a, 2010b) positive association between (interpretive biased) ToM and anxiety-related interpretive bias hypothesis and brought preliminary evidence for the deficit interpretive biased ToM hypothesis for this developmental window. As Nikolić et al. (2019) stated, without a proper ToM, children may be more confused in social situations, which will make room for negative interpretations to emerge. These findings are in line with other studies that found low ToM performance in socially anxious adolescents (Öztürk et al., 2020), as well as in adolescents with major depression (Kilinçel et al., 2020).

Interpretive biased ToM was correlated with the ability to understand and reason that there are certain circumstances where it's warranted for someone to doubt different sources of information (Mills & Elashi, 2014). After the age of 7, children become more aware of the subjective nature of the interpretations and of the fact that a situation can have multiple outcomes, threatening, but also neutral (Hadwin & Field, 2010). The interpretive bias may or may not be present early on, but the ability to understand other's mental representations, not only as being different across individuals but also different as a function of individuals biased beliefs may act as a buffer between the existence of the interpretive bias and the presence of the disconfirming evidence by allowing the child to be critical and skeptical towards their apprehensions (Mills & Elashi, 2014), and by allowing the child to consider other interpretations that are more neutral.

These results can then be used to construct training programs for these socio-cognitive abilities with aiming to prevent emotional and social difficulties in children. Understanding the other's mental representations as a function of their various biased belief systems may act as a buffer between children's own interpretive bias and disconfirming evidence provided by reality. This allows the child's criticism and skepticism to come into action when confronting their own initial fearful interpretations, while understanding that alternative interpretations co-exist, relying on different belief systems than theirs.

Limitations

The study has several limitations that need to be taken into consideration for further inquiries. Firstly, our sample size is small, and it may be responsible for not highlighting possibly significant existing relationships. Another limitation refers to the low internal consistency of the Bias Task. In addition, our novel interpretive understanding task has not yet been thoroughlty validated. Another shortcoming is that aside from the inventory, there was no other ToM measure in our study. We also did not measure participant's verbal abilities, an important factor that could partly explain the differences in children's verbal responses on the MIT task. Despite the acknowledged limitations, to our knowledge it was the first study to date that investigated the relation between interpretive bias, anxiety, and ToM for in this developmental window (Field & Lester, 2010a, 2010b).

CHAPTER 4

RELATING INTERPRETATIVE DIVERSITY UNDERSTANDING TO ANXIETY SYMPTOMS AND PARENTAL PRACTICES IN MIDDLE CHILDHOOD

1.1.Introduction

At around 7-8 years of age, children realize that people exposed to the same situation can construct diverse interpretations due to their previous beliefs, attitudes, and knowledge (Carpendale & Chandler, 1996; Pillow & Mash, 1998). This understanding of interpretive diversity has been termed *constructive* or *interpretive ToM (*Carpendale & Chandler, 1996). Another dimension is the understanding of mental activities, termed *constructivist ToM* (Weimer et al., 2017). The potential convergence between these two dimensions of understanding interpretive diversity remains unexplored.

ToM deficits have been long associated with various forms of psychopathologies, such as anxiety and depression disorders (Plana et al., 2014). However, much less is known about ToM deficits in anxiety during middle childhood (Moldovan & Visu-Petra, 2022; Tafreshi & Rachine, 2016). Only one study looked at interpretive ToM – biased in relation to anxiety and as their anxiety symptoms and number of threatening interpretations of an ambiguous situation increased, their ability to understand that two people can form two different interpretations on the same ambiguous action was reduced (Moldovan & Visu-Petra, 2022).

As Weimer and colleagues (2021) have discussed, in order to fully understand the developmental path of ToM through middle childhood, we need to investigate the interrelations between ToM and contextual factors such as parental practices. To our knowledge, only one study investigated interpretive diversity in relation to parental practices. Tafreshi and Racine (2016) have found that the frequency of mother-child talks, and mother's conceptions of knowledge were positively correlated with children's performance on the Droodle Task (interpretive ToM - perceptual), reinforcing the idea that rich conversations about psychological processes are important for children's understanding of the mind.

Maternal warmth is a relevant predictor for children's social and emotional development (Davidov & Grusec, 2006). Moreover, warm and nurturing parental practices are negatively associated with internalizing symptoms (Rose et al., 2018). On the other hand, *rejection*, has been associated with an increase in internalizing and externalizing symptoms (Conger et al., 2002).

Parental overprotection might increase the risk for developing both internalizing and externalizing problems (Muris et al., 2003).

Current Studies

The main aim of our two studies was to broaden the limited knowledge on the understanding of interpretive diversity by bringing together, for the first time in the literature, two approaches to it: the understanding of the multiple interpretations on ambiguity (interpretive ToM - perceptual; Lalonde & Chandler, 2002) and the understanding of cognitive activities as part of interpretation construction (constructivist ToM; Weimer et al., 2017). We were also interested in exploring how parental practices and emotional symptoms relate to this advanced form of ToM.

Firstly, we anticipated a positive relation between interpretive ToM - perceptual and constructivist ToM, as two facets of the understanding of *interpretive diversity*. A second hypothesis was that *warm parental practices* would positively predict children's performance on the constructivist ToM and interpretive ToM - perceptual tasks, while overprotection and rejection parental practices would be negative predictors. Thirdly, we hypothesized that children's *anxiety symptoms* would be negatively related with their interpretive ToM - perceptual and constructivist ToM performance. Last, but not least, warm parental practices were also expected to be negatively related with anxiety symptoms, as opposed to overprotective and rejection practices.

1.2. Study 3[3]

1.2.1. *Method*

Participants and Procedure

We recruited 136 primary school children with ages between 8-12 years (M = 120 months, SD = 12.85). Their household earnings were reported as the minimum (36%) or above minimum wage (36.8%). Parent's education varied (35.3% of mothers and 29.4 % of fathers completed a bachelor's degree).

In the first step, parents completed the demographic questionnaire and the parent version of the anxiety and parental practices questionnaires. Afterwards, children were administered the child version of the two questionnaires and the short version of the Constructivist Theory of Mind Interview, all in one session. In the last step, children were tested individually, by an experimenter, in the school counselor's office, with the Droodle task and the IQ tasks.

[3] Study 3 described in this chapter has been accepted with minor revisions in the *Journal of Evidence Based-Psychotherapies*: Moldovan, Prodan, Coman & Visu-Petra (2022).

Materials

The Constructivist Theory of Mind Interview-Short Version. We used the paper-pencil short version of the interview developed by Weimer et al. (2017), which contains 6 scenarios from the original 10. In these scenarios one or two persons are faced with visual, auditory, or verbal stimuli and children were asked about the person(s)/s'(s) mental processes (Comprehension, Attention, Memory, Comparison, Planning, and Inference) regarding those stimuli. If children's response referred to the inherent differences of mental processes across individuals it was scored as an "Active Mental Process Explanation". Based on 25 % of the responses, the interrater reliability was very high (Cohen's kappa = .90).

The Restricted Picture Paradigm (Droodle Task). Interpretive ToM - perceptual was assessed using the `Droodle` task, displaying various drawings (e.g., an elephant and an orange; Lalonde & Chandler, 2002). The participants were asked to infer how two dolls would interpret the identity of the full drawing based on an ambiguous part of it. The participants' responses to each drawing were coded according to the connection of children's response with the full original picture and the similarity between the two puppets interpretations. Only if they answered correctly for both criteria, their score was 1. Based on 25 % of the responses, the interrater reliability was very high (Cohen's kappa = .84).

Parental Rearing Behaviors- Egna, Minnen, Betraffande, Uppfostran (EMBU). Parental rearing behaviors were assessed with adolescents' version of the EMBU questionnaire (My memories of upbringing; Perris et al., 1980) – EMBU – A (Paloş & Drobot, 2010) and parents' version of the same instrument – EMBU – P. The 49 items used from the EMBU-A questionnaire evaluate children's perception regarding their parents' rearing practices according to three different factors: Emotional Warmth, Rejection and Overprotection. Children completed the assessment for both parents parental practices. EMBU – P has an identical structur with the items being formulated from the parents' perspective (only Emotional Warmth and Overprotection subscales were used).

The Revised Child Anxiety and Depression Scale - Parent and Child Versions (RCADS). RCADS (Visu-Petra et al., 2011; Chorpita et al., 2000) is a 47-item questionnaire used to measure the frequency of the most relevant anxiety and depression symptoms. Both caregiver's and children's versions were administered. The RCADS for parents has high internal consistency, α = .85, as well as RCADS for children, α = .88.

IQ - Vocabulary, Comprehension, and Coding. Children's verbal and non-verbal IQ was evaluated using several subtests (Comprehension, Coding, and Symbol Search) from the Romanian adaptation of the WISC-IV (Dobrean, 2012; Wechsler, 2004). The WISC-IV is widely used and has excellent internal consistency, test–retest reliability, criterion validity, and construct validity (Wechsler, 2004).

1.2.2. *Results*

For the questionnaires, we used the multiple imputation method to generate estimates for missing values (Penn, 2007) and Field's (2009) method for outliers. We further conducted a mixed ANCOVA in order to find differences between children in terms of proportions of the response categories. We introduced the three ToM Interview responses as a within factor variable (Active Mental Process Explanation, Non-Active Mental Process Explanation, No Explanation), age as a between factor variable (that was coded as a dummy variable with two categories, 1 for 8- to 10-year-olds, and 2 for 11- to 12-year-olds) and Comprehension as a covariate. Since the sphericity assumption was violated, ANCOVA test statistics were estimated using the Greenhouse – Geisser method. Our results indicated that there was a significant difference between the ToM responses, $F(1.259, 16.258) = 16.590$, $p < .001$, $\eta_p^2 = .11$ and a significant interaction between ToM responses and age, $F(1.536, 16.258)$, $p < .001$, $\eta_p^2 = .086$. Considering the pairwise contrasts, children in both categories of age tended to give significantly higher proportion of responses with no explanation than with non-active and active mental process explanations. The contrasts showed that 8- to 10-year-old children had significantly higher proportion of responses with no explanation and significantly lower proportions of active mental process explanations than 11- to 12-year-olds.

The interpretive ToM - perceptual task (Droodle task) did not correlate with any anxiety or parental practices variables, except with Warmth (Parent), $r_s(136) = .17$, $p = .04$. We have obtained positive correlations between total scores on Anxiety Child and Rejection Mother, $r_s(136) = .35$, $p < .001$, Overprotection Mother, $r_s(136) = .32$, $p < .001$, Rejection Father, $r_s(136) = .25$, $p = .003$, as well as with Overprotection Father, $r_s(136) = .32$, $p < .001$. Similar correlations were obtained with parent's reports of child anxiety, as we have obtained significant positive correlations between Overprotection Parents and Anxiety Parent, $r_s(136)=.31$, $p < .001$, as well as with Internalizing Parent, $r_s(136) = .33$, $p < .001$.

In order to determine the specific effect of parental practices on anxiety we ran a series of robust hierarchical regressions using the bootstrap method. In the first regression, we included as

the dependent variable the level of depression symptoms as reported by children. The control variables were age, Comprehension, Coding, and Symbol Searching. In the second step, we included two composite scores reflecting the means of both parent's levels of Rejection and Overprotection. The results showed that the overall regression model predicted 26% of the variance, R^2 = .26, F(6, 129) = 7.544, p < .001. Depressive symptoms were positively predicted only by the Rejection of both parents, β = .495, p = .001, CI [.319; .658]. In the second regression, we included general anxiety disorder as the dependent variable, and the predictors remained the same as those described above. The overall model explained 16.8% of the variance, R^2 = .168, F(6, 129) = 4.327, p < .001. The control variables were not significant. The results showed that the Rejection outcomes of both parents positively affects the level of general anxiety symptoms, β = .21, p = .005, CI [.057; .376]. At the same time, the Overprotection result of both parents was a positive predictor of the level of general anxiety symptoms, β = .175, p = .004, CI [.056; .287].

1.2.3. *Discussion*

In the current study, we found significant relations between parental practices, anxiety symptoms, and IQ tests. We also found that parental practices were significant predictors of various anxiety symptoms. Firstly, the younger children tend to give more No responses and fewer active mental process explanations than the older children. Secondly, it seems that rejection and overprotection of both parents are important predictors of various anxiety symptoms.

However, the hypothesis according to which the two measures of interpretive diversity understanding would be positively associated was not fully supported. Therefore, also taking into account the fact that the written responses of the children were not particularly detailed, we conducted a second study in which we used the extended version of the Constructivist Theory of Mind Interview that implies an individual discussion between the researcher and each participant, without a time limit.

1.3.Study 4 [4]

1.3.1. *Method*

Participants and Procedure

We included 200 children with ages between 8 and 12 years (M = 124 months, SD = 9.8). Parental education varied (41% of mothers and 47 % of fathers finished a bachelor's degree). The

[4] Study 4 described in this chapter has been accepted with minor revisions in the *Journal of Evidence Based-Psychotherapies*: Moldovan, Prodan Coman & Visu-Petra (2022).

three phases of the study were the same as in the previous one, except that the constructivist ToM interview was administered by an experimenter, in the school counselor's office, along with the Droodle and verbal tasks.

The same questionnaires from Study 3 were used, more specifically the RCADS-Parent and Child versions (Visu-Petra et al., 2011; Chorpita et al., 2000), and EMBU - Mother, Father, the children versions, and the EMBU Parent, the parent version. The internal consistency was low for EMBU Mother, α = .64, moderate for EMBU father, α = .74, and high for EMBU Parent, α = .80. As for RCADS Children, the internal consistency was high, α = .87, as well as for RCADS Parent, α = .87. The interpretive ToM - perceptual task, Droodle task, had high interrater reliability, based on 10% of the responses, Cohen's kappa = .85.

Measures

The Constructivist Theory of Mind Interview - Long Version. We used the extended version of the Constructivist Theory of Mind interview to allow for a more ample child-interviewer interaction without any time pressure. Based on 10% of the responses, interrater reliability was very high (Cohen's kappa = .86).

Vocabulary Test. We used the Expressive Vocabulary from the WISC-IV Verbal Comprehension Index to evaluate children's word knowledge (Wechsler, 2014).

1.3.2. *Results*

We have found a positive correlation between Active Mental Process Explanations and Droodle task, $r_s(200) = .16$, $p = .018$, supporting our first hypothesis. As children reported more active mental process explanations, they were also more likely to offer two different interpretations on the ambiguous pictures. When we split the data into two groups, according to age, their correlation, however, was not significant for the younger group (8- to 10-years old) but remained significant for the older one (11- to 12-years old), $r_s(200) = .44$, $p < .001$. Also, both ToM measures were positively correlated with age; for Active Mental Process Explanation, $r_s(200) = .31$, $p < .001$, and for Droodle task, $r_s(200) = .15$, $p < .001$. The relation between Active Mental Process Explanations and Droodle Task remained marginally significant when controlling for age, $r_s(200) = .13$, $p = .065$. Moreover, the Non-Active Mental Process Explanations were negatively correlated with performance on the Droodle task, $r_s(200) = -.14$, $p = .047$.

A first look over the two sets of ToM interview data showed an increase in the proportions of Active Mental Process Explanations in the second study. In order to analyse the differences

between the proportion of responses, we conducted a mixed ANOVA. As a between factor variable, we introduced age (coded as a dummy variable with two categories, 1 was 8- to 10-year-olds, and 2 was 11- to 12-year-olds). The results showed no difference between age groups, but there was a significant difference within individuals regarding ToM. According to the post-hoc tests (using the Bonferroni correction), children of both ages tended to show a higher response proportion with non-Active Mental Process Explanations than with Active Mental Process and No explanations, $p < .001$.

Using the Spearman's correlation test, we obtained several significant correlations between ToM measures and parental practices measures. More specifically, a positive correlation between Active Mental Process explanations and Warmth Mother, $r_s(200) = .23$, $p = .001$, as well as with, Warmth Father $r_s(200) = .19$, $p = .005$, respectively. Moreover, the Active Mental Process and Droodle task seemed to be negatively correlated with Rejection Mother.

In order to test our second hypothesis, we conducted a hierarchical regression using the bootstrap method. We introduced active mental process explanations as the dependent variable. In the first step, we included as a control variable, age, and mother's education. In the second step, we introduced warmth from both parents (composite score). In the third step, we added internalizing symptoms. The overall model predicted 21.7% of variance ($R^2 = .217$, $p < .001$). All, except internalizing symptoms, were significant predictors, age $\beta = .005$, $p = .001$, CI [.004; .007], mother's education $\beta = .017$, $p = .022$, CI [.005; .030], Warmth Mother and Father, $\beta = .008$, $p = .004$, CI [.003; .012]. The effects are significant albeit very small.

We tested for significant differences between the three groups of Droodle Task (no interpretive ToM - perceptual, partial interpretive ToM - perceptual, and total interpretive ToM - perceptual) regarding the level of separation anxiety. The results showed that there were significant differences between groups, $X^2 = 10.179$, $p = .006$. Mann–Whitney tests were used to follow up this finding. A Bonferroni correction was applied so that all effects are reported at a .0167 level of significance. It appeared the only significant difference is between the group with no interpretive ToM - perceptual and the group with total interpretive ToM - perceptual. The group with total interpretive ToM - perceptual had a significantly lower level of separation anxiety than the group with no interpretive ToM - perceptual, $U = 1781.500$, $p = .002$.

Then, we used the Kruskal-Wallis to see if there were significant differences between groups regarding the level of Panic Attack, $H(2) = 8.971$, $p = .011$. A Bonferroni correction was

applied so that all effects are reported at a .0167 level of significance. The only significant difference was obtained between the group with no interpretive ToM - perceptual and the group with total interpretive ToM - perceptual. The group with total interpretive ToM - perceptual had a significantly lower level of Panic Attack compared to the group with no interpretive ToM - perceptual, $U = 1856.500$, $p = .006$. There were no differences between groups regarding the levels of depression.

Thirdly, the following Kruskal-Wallis showed significant differences between groups with respect to the levels of rejection of both parents, $H(2) = 9.892$, $p = .007$. Children with no interpretive ToM - perceptual had significantly higher levels of rejection from both parents compared to children with total interpretive ToM - perceptual, $U = 1754.500$, $p = .002$. There were no differences between groups regarding the level of overprotection of both parents.

We obtained negative correlations between both interpretive diversity understanding tasks and Anxiety and Internalizing Score Child. This means that as children reported fewer anxiety symptoms, they gave more active mental process explanations. They were also more likely to offer two different interpretations on the ambiguous pictures. Hence, we confirmed our third hypothesis. Again, there was only one variable, Comprehension, that significantly correlated with anxiety, $r_s(200) = -.20$, $p = .004$, and internalizing, $r_s(200) = -.20$, $p = .003$) symptoms reported by parents.

In order to test our fourth hypothesis, we conducted a hierarchical regression using the bootstrap method. As the dependent variable, we added internalizing symptoms. We introduced age as a control variable, and then in the second step, we introduced rejection and overprotection scales of both parents. In the third step, we added Active Mental Process Explanations and Droodle task. The overall model predicted 25.4% of variance ($R^2 = .254$, $F(5, 194) = 13.204$, $p < .001$). Results showed that only rejection of both parents was a positive and significant predictor of internalizing symptoms, $\beta = 1.152$, $p < .001$, CI [.642; 1.623].

1.3.3. General Discussion

The first results showed that the constructivist ToM performance wasn't associated with any of the other measures. As explanations, there are some differences between our study and Weimer and colleagues' (2017), with respect to administration method: our age was smaller than Weimer and colleagues (2017) freshmen high-schoolers and the number of questionnaire applied in one phase. We inferred that the children didn't have the necessary cognitive resources to go through it properly and time to write down the answers (the mean length of response was between

3-5 words). On the other hand, from a theoretical standpoint, Weimer and colleagues (2017) revealed that only around 10 and 12 years of age children significantly change their responses in the sense that they consider the differences in mental activities as required when reaching different cognitive outcomes in the same situation (over 50% of our participants in both studies were below this age). In line with Weimer and colleagues (2017), we found notable age differences between children's responses to the interview, with younger children giving more No explanation responses and fewer Active Mental Process Explanations than older children. Following these considerations, in the second study, we used the extended version of the Constructivist Theory of Mind Interview and the new conditions improved children's performance (Active explanations, *M* = .26) compared to children from the first study (*M* = .06). Future research should consider these aspects when choosing between the short and extended versions of this task.

The most notable improvement in the second study was the positive correlation between the two tasks of interpretive diversity understanding, partly explained by age. This indicates that the two measures are tapping the same ability of interpretive diversity understanding, yet are independent enough to address different aspects of it (Schaafsma et al., 2015). Taking this into account, we view interpretive diversity understanding as a multidimensional process, with the two tasks reflecting different components: interpretive and constructivist ToM.

The Droodle Task has been constructed for younger children, and it appeals more to the child's imagination, and creative processes. We didn't find any age differences in terms of correct responses (Droodle task), but almost half of the children in both studies answered on both trials with two different valid interpretations of the same ambiguous picture (total interpretive ToM - perceptual; 47% in Study 3 and 57% in Study 2).

We have found that the younger children (8- to 10- years old) gave a significantly higher proportion of responses with No Explanation, and had fewer responses with Active Mental Process Explanations as well, compared to the older group (11- to 12- years old). In the second study, using the long version of the interview, we found that children of both ages showed a higher response proportion with Non-Active Mental Process Explanations than with Active Mental Process and No explanations. In line with our study, Weimer and colleagues (2017) found that children between 8 and 11 years tended to give more responses with non-active mental process explanations than adults.

Children with higher understanding of interpretive diversity had lower anxiety and internalizing symptoms. This supports our third hypothesis, as well as the deficit ToM hypothesis in anxiety (Reid, 2017). These are in line with previous studies that found higher mentalizing capacities were significantly associated with lower depressive, panic disorder, and separation anxiety symptoms (Caputi et al., 2018), as well as with low levels of separation and social anxiety (Scaini et al., 2020) in middle cnildhood and adolescence. These results have clinical implications, as training and treatment programs could include this socio-cognitive ability in order to improve anxious children's social functioning (Ooi et al., 2008).

In the second study, as children reported more parental practices based on affection, support, and emotional warmth, their ability to understand the constructivist nature of the mind increased. This relation indicates that maybe in a parent-child relationship marked by support and affection, the child might feel more encouraged to explore different ideas about people's intentions. When this security and support are lacking, the opposite is expected. We found that children with the highest score on parental practices based on rejection were the ones who couldn't understand that an ambiguous picture can be interpreted in two different and valid ways. These results are in line with literature on younger children (Hughes & Devine, 2016),

In both studies, we found partial support for our fourth hypothesis. We found that parental practices based on rejection and overprotection (as reported by children) are positive predictors for anxiety and internalizing symptoms, in line with other studies (Johnco et al., 2021). Even adolescents and young adults who perceive their parents as rejecting, controlling and coercive, reported higher emotional dysregulation, suppression of sadness and worry, and more social withdrawal, which are related to anxiety symptoms (Gardner & Zimmer-Gembeck, 2018; Niditch & Varela, 2012; Wood et al., 2003).

Limitations

The limitations of our studies were using the paper and pencil version on a very young group that still struggled at the writing tasks in a time-limited setting, and also social desirability on parental practices and children's emotional dimensions evaluation.

CHAPTER 5.
INDIVIDUAL DIFFERENCES IN INTERPRETIVE DIVERSITY UNDERSTANDING: AN INTEGRATIVE PERSPECTIVE

5.1. Thesis Overview

The present thesis has investigated the *interpretive diversity understanding* in order to provide a better apprehension of its developmental trajectory, as well as the individual differences that exert an influence on this ability in middle childhood. In the first chapter, we bring together the many conceptualizations of interpretive diversity understanding, which includes three different types of interpretive diversity understanding: *interpretive ToM - perceptual*, *interpretive biased ToM* and *constructivist ToM* (Miller, 2000; Weimer et al., 2017). **Chapter 2** describes an empirical study with middle school aged children, that addressed the relation between individual differences on the cognitive (WM, Shifting/Inhibition, language abilities) and emotional dimensions (anxiety symptoms), and the *interpretive biased ToM* type, as well as other Advanced ToM abilities (Strange Stories, Faux-pas understanding), using vignettes describing diverse ambiguous social situations. **Chapter 3** continues the investigation between the *interpretive biased ToM* and emotional individual differences (anxiety symptoms and the interpretational bias), using other ambiguous social situations vignettes, with pictures, in a group of middle school aged children. **Chapter 4** is comprised of two studies, with middle school aged children, in which we looked at the relationship between two important types, the *interpretive ToM - perceptual*, and the *constructivist ToM,* in relation with contextual individual differences, such as parental practices, and emotional individual differences (anxiety symptoms; see Table 1 for main findings).

5.2. Research Questions: Main Findings

According to Weimer and colleagues' (2021) integrative model, in order to have a cohesive theoretical framework of Advanced ToM in middle childhood, it is paramount to tackle the correlates and antecedents in ToM development, such as the emotional, cognitive and contextual individual differences. Firstly, we hypothesized that different EF components would be positively and uniquely related to interpretive diversity understanding (Study 1). Secondly, we hypothesized that anxiety would be negatively associated with interpretive diversity understanding (Study 1, 2, 3 and 4). Thirdly, we hypothesized that parental practices would be associated with interpretive diversity understanding based on their specificity (Study 3 and 4). Last but not least, we

hypothesized that the interpretive diversity understanding types would have bidirectional relationships (Study 3 and 4). We directly tested these hypotheses in our studies and we will summarize our main findings.

5.2.1. Are EF prerequisites for interpretive diversity understanding?

We found an interesting finding when we separately analyzed the *interpretive biased ToM* conditions. In the *contrasting valence conditions*, the valence of the character's bias could be of different or similar valence to the one of the actor's action. We found a positive association between performance on the *consistent bias stories* (character's bias and the actor's action have the same valence) and Switching Index. However, when the age was taken into account, this relationship was insignificant. Our preliminary results seem to indicate Comprehension and WM to be positively correlated with the total performance on the Advanced ToM tasks, and the Comprehension as the only predictor of it.

5.2.2. Are emotional individual differences negatively associated with interpretive diversity understanding?

We confirmed, for the first time in the literature, the ToM deficit hypothesis in anxiety, with interpretive diversity understanding. Anxiety symptoms, as well as the tendency to interpret stimuli as threatening (interpretive bias), were lower in children with a better understanding of the interpretive nature of the mind.

5.2.3. Do parental practices influence interpretive diversity understanding?

Our results strengthen the idea of parental practices as contextual factors with great influence on interpretive diversity understanding in middle childhood. It seems that parental practices based on affection and support are positively correlated with the understanding of perceptual ambiguity, as well as mental activities, and they also predict the latter. On the other hand, parental practices based on rejection and harsh parenting negatively predicted the understanding of perceptual ambiguity.

5.2.4. Are the different types of interpretive diversity understanding interrelated?

So far, our preliminary results support a positive interrelation between two types of interpretive diversity understanding, as well as between one type of interpretive diversity understanding and earlier forms of ToM, in middle childhood.

Table 1. *Summary of main findings and conclusions*

Study	Age range	Type of interpretive ToM	Task description	Main findings
Chapter 2 Study 1	9 - 12 years *(N = 120*)	Interpretive biased ToM	***Interpretive ToM (adapted from Pillow, 1991; Pillow & Weed, 1995).*** The stories had one character and an actor. The character had *two biased beliefs* about the actor, one of which was relevant to the situation. The actor engages in an action, that remains ambiguous to the character, but not to the child. We intersected two conditions, *nature of ambiguity* and *contrasting valences.* The nature of the *ambiguous action* could be one of two types: either the action had an ambiguous intention (*intended or accidental*) or the identity of the action was ambiguous (*action identification condition*). The character's relevant biased belief and disambiguating information were either of *contrasting valences* or not. We had two stories in each of these two conditions. The experimenter asked a *bias memory question*, an *event memory question*, *an access to knowledge question*, and *an interpretation question*. The interpretation question targeted the character's interpretation of the actor's action, and a correct answer would require a consideration of the character's prior experience (biased belief)	1. We **did not find any correlations** between the *total interpretive biased ToM* score and *EF*. 2. We found **a positive correlation** between *shifting* and *inhibition* and 2nd ToM (Strange Stories). 3. *Comprehension* and *WM* **were positively correlated** with *Total ToM* (Strange Stories, faux-pas understanding and interpretive ToM). 4. *Comprehension* **was also a predictor** of *Total ToM*. 5. *Anxiety* symptoms **did not correlate** with either of the *Advanced ToM* tasks. 6. Our findings emphasize **ToM as an incoherent construct** that needs to be treated multi- dimensionally.

			with the actor. If the child answered correctly to all of the questions, the story was scored with 1.	
Chapter 3 Study 2	9 - 11 years (*N = 86)*	Interpretive biased ToM	**Multiple Interpretation task (adapted from Pillow, 1991).** Each of the 4 MIT vignettes followed a Bias Task story. In the Bias Task story, the actor did something ambiguous towards the child. The MIT stories had one character and one actor. The character had a pre-existing belief about the actor, described in a more general attitude. The actor performed a similar ambiguous action to the one done by the actor in the Bias Task, but now it was directed towards the character. We had two conditions, *contrasting knowledge* and *contrasting biases.* The stories either had information that disambiguates the action, but available only to the child (*with knowledge*) or not (*no knowledge*). There were two stories in each one. The child was introduced as a second character in the story, and their interpretation on the ambiguous action done in the Bias Task was taken into account. In the stories with knowledge, the valence of the character's bias was opposed to the valence of the knowledge, but of the same valence to the child's previously expressed interpretation. In the stories without knowledge, the valence of the character's bias and the child's interpretation were of contrasting valences.	1. We found **a positive association** between *interpretive bias* and *anxiety symptoms*. 2. We found **a negative relationship** between *mentalizing abilities* (parental evaluations) and *child anxiety symptoms*. 3. We found **a negative relationship** between *mentalizing abilities* (parental evaluations; Advanced Subscale) and *interpretive bias* (Bias Task) 4. Children who *used the character's biased belief to construct the character's interpretation of the ambiguous situation* (interpretation question; an indicator of *interpretive biased ToM*) **had lower scores** on *interpretive bias* (Bias Task) than the children who did not. 5. Children *who did not justify the inferred interpretation with the biased belief* (justification question; indicator of *interpretive biased ToM*) **had higher anxiety symptoms than those who did this once**. 6. Children *who constructed two different justifications, one of which was negative* **were having higher**

				basic ToM abilities (parental inventory) than those who did not.
Chapter 4 Study 3	8 - 12 years (*N = 136*)	Interpretive ToM - perceptual	**Droodle Task.** Interpretive ToM – perceptual was assessed with two drawings (e.g., an elephant and an orange). After seeing the full picture, the drawings were occluded with an envelope, leaving only an ambiguous part to be seen. The participants were asked to infer how each of the two dolls would interpret the identity of the full drawing based on the visible, ambiguous part of it.	1. The *ToM abilities* **did not correlate with each other**. 2. Children **had significantly higher proportion of responses with no explanation** than with non-active and active mental process explanations (*constructivist ToM*). 3. Younger children (8- to 10- year-olds) **had significantly higher proportion of responses with no explanation and significantly lower proportions of active mental process explanations** than older children (11- to 12-year-olds; *constructivist ToM*). 4. *The interpretive ToM - perceptual* (Droodle task) **was positively correlated** with Warmth Parental Practices. 5. *Children's anxiety* **was positively correlated** with *Rejection and Overprotection Parental Practices of both parents.* 6. *Children's anxiety and internalizing symptoms* (parent evaluation) **positively correlated** with *Overprotection Parental Practices* (parent evaluation). 7. *Children's depressive symptoms* **were positively predicted** by the *Rejection Parental Practices of both parents*.
		Constructivist ToM	**Constructivist ToM interview-Short Version.** In the 6 scenarios one or two persons are faced with visual, auditory, or verbal stimuli and children were asked about the person(s)/s' mental processes (Comprehension, Attention, Memory, Comparison, Planning, and Inference) regarding those stimuli. The questions explored children's understanding of interpretative diversity and whether they considered this to be a consequence of the constructive nature of mental processes or other stimulus-related factors. Children were instructed to circle "Yes" or "No" for each question and to provide further explanations if they answered "Yes". Their answers were evaluated according to their references to the inherent differences in mental processes across individuals.	

				8. *Children's general anxiety symptoms* **were positively predicted** by the *Overprotection Parental Practices of both parents*.
Chapter 4 Study 4	8 - 12 years (*N = 200*)	interpretive ToM - perceptual Constructivist ToM	**Droodle Task.** Interpretive ToM – perceptual was assessed with two drawings (e.g., an elephant and an orange). After seeing the full picture, the drawings were occluded with an envelope, leaving only an ambiguous part to be seen. The participants were asked to infer how each of the two dolls would interpret the identity of the full drawing based on the visible, ambiguous part of it. **Constructivist ToM interview-Long Version.** The experimenter presented 10 scenarios in which one or two persons are faced with visual, auditory, or verbal stimuli and children were asked about the person(s)/s' mental processes (Comprehension, Attention, Memory, Comparison, Planning, and Inference) regarding those stimuli. The questions explored children's understanding of interpretative diversity and whether they considered this to be a consequence of the constructive nature of mental processes or other stimulus-related factors. Children were instructed to answer with "Yes" or "No" for each question and to provide further explanations if they answered "Yes". Their answers were evaluated according to their references to the inherent differences in mental processes across individuals.	1. *Both ToM abilities* **increased with age**. 2. The *ToM abilities* **were positively correlated** for the older children (11- to 12-years old). 3. There was **a positive correlation** between *constructivist ToM* (Active Mental Process explanations) and *maternal and paternal Warmth (Parental Practices)*. 4. There was **a positive correlation** between *constructivist ToM (*Active Mental Process explanations) and *maternal Rejection (Parental Practices)*. 5. There was **a positive correlation** between the *interpretive ToM - perceptual* (Droodle task) and *maternal Rejection (Parental Practices)*. 6. *Age, mother's education, mother and father Warmth (Parental Practices)* **positively predicted** the *constructivist ToM* (Active Mental process explanations). 7. Those who had the highest *interpretive ToM – perceptual* (Droodle Task) **had lower** *separation*

			anxiety symptoms than those who did not. The same was found for *panic attack symptoms*. 8. Those who had the highest *interpretive ToM – perceptual* (Droodle Task) **had a lower score of** *Rejection Parental Practices of both parents* than those who did not. 9. *Rejection Parental Practices of both parents* **predicted** *children's internalizing symptoms*.

5.3. Theoretical Contributions

Our studies expand our knowledge on interpretive diversity understanding (e.g., Carpandale & Chandler, 1996; Pillow, 1991), towards an *integrative perspective*, in the framework of individual differences. In the following sections, we will integrate our findings in the existing theoretical framework of advanced ToM in middle childhood (Weimer et al., 2021).

5.3.1. ToM and EF

The ability to switch between different kinds of information, external and internal, seems to be important in understanding the interpretive nature of the mind. The ability to reason about the mind (total ToM), in different conditions and situations, is related to the ability to consider general principles and knowledge in social situations (Comprehension), and remember words while performing mental operations (WM). These findings replicate existing evidence that support the hypothesis of ToM and EF, as incoherent, multi - processes constructs (Schaafsma et al., 2015). EF and interpretive diversity understanding are developing in tandem in middle childhood.

5.3.2. ToM and Anxiety

We have tested, for the first time in the literature, the deficit hypothesis in a more advanced ToM form, in middle childhood, using four different ToM measures (Study 2, 3 and 4). Children's ability to appreciate the individual mental content, in the form of biased belief, as important when reasoning about another person's interpretation of a situation is negatively correlated with their anxiety symptoms, as well as their tendency to interpret stimuli as threatening. The same was found for children's ability to appropriately explain the inferred character's interpretation by referring to the individual's mental content. Also, as children's understanding that two people can have two valid interpretations over the same perceptual ambiguous drawing increased, their anxiety level decreased. These emphasize the lack of mental resources and a degree of cognitive rigidity when anxiety level is high, which hinder children's flexibility when considering other factors as relevant in how people interpret their surroundings and other's actions.

5.3.3. Tom and PP

It seems that children's ability to appreciate the interpretive nature of the ambiguous drawing by acknowledging that more than one interpretation is possible is related to their parental practices that are based on warmth, support and affection (Study 3). Complementary, children who did not have this ability, reported higher parental practices based on rejection (Study 4). The ability to reason on mental processes, such as memory or attention, as valuable factors in how people

might get different outcomes from a situation, is predicted by both parent's warmth parental practices, age and education. These are in line with the existing findings on the importance of a good, healthy attachment relationship for the child's development (Benga, 2004; Tafreshi & Racine, 2016).

5.3.4. Interrelations between ToM abilities

Our findings support the associations between various ToM abilities, even though they are weak and inconsistent. In conclusion, children's ability to understand that different individuals bring their own subjective content to the situation, and appreciate the ambiguity of a social situation (biased interpretive ToM) were reported by their parents as having higher ToM abilities (Study 2). The ability to appreciate that the ambiguous drawing can be interpreted in two different ways (interpretive ToM – perceptual) and that mental activities are responsible for the various outputs two people can offer in a given situation (constructivist ToM), improves with age. Moreover, they also seem to correlate with each other in the older group, 11 - 12- years old, and not in the younger group, 8 – 10- years old. These results support our proposed integrative model on interpretive diversity understanding that places understanding mental activities (constructivist ToM) as the most advanced form, developing at a later age than the other two types of interpretive ToM.

Children's failure to respond with any perspective on how different people interact with the same situation (constructivist ToM) was negatively related to their appreciation of the perceptual ambiguity of ambiguous drawings (interpretive ToM – perceptual). Despite the modifications made to ease the task, their performance did not increase considerably, emphasizing the idea that the constructivist ToM was still rudimentary in this age interval. This supports again the integrative model proposed, and the differential abilities implied in the three types of interpretive diversity understanding, as well as the need for them to be treated individually.

5.4. Empirical contributions

5.4.1. Study 1

- To our knowledge, this study is the first one to investigate the relation between executive functions, interpretive ToM, and other two Advanced ToM abilities (Strange Stories and Faux-pas understanding) in the same design;
- Our preliminary findings indicated that WM and Comprehension are important correlates with the total sum of three ToM abilities;

- In addition, Comprehension predicted significantly above age, income and WM, the total sum of ToM abilities (Strange Stories, Faux-pas understanding and biased interpretive ToM).
- We developed a new task for measuring advanced ToM, a modified version of Pillow's (1991) and Pillow and Weed's (1995) tasks.

5.4.2. Study 2

- To our knowledge, this is the first study to investigate and confirm *the ToM deficit hypothesis in anxiety* with interpretive diversity understanding in middle childhood;
- As children scored lower on anxiety symptoms, their ToM abilities were perceived as being higher (Advanced ToM Subscale inventory). As children scored higher on anxiety symptoms, their ToM abilities (Early, Basic and Advanced ToM Subscale inventory) were rated by their parents as being lower;
- A novel finding is that as children's tendency to select a threatening interpretation increased, their advanced ToM abilities were perceived as being lower;
- This study found a *link between anxiety symptoms and interpretive bias scores*;
- We developed a new task for measuring advanced ToM, a modified version of Pillow's (1991), and merged it with the interpretive bias task (MIT task).

5.4.3. Study 3

- To our knowledge, this is the first study to investigate together two types of interpretive diversity understanding, the interpretive ToM – perceptual and the constructivist ToM;
- Preliminary results suggested an interaction between age and type of response. Younger children (8- to 10-year-old) failed to answer in any way the questions of the interview compared to the older ones (11- to 12-year-old);
- Children who attributed more than one valid interpretation to an ambiguous drawing, reported parental practices based on affection and support;
- Children's anxiety and internalizing symptoms (self-evaluation and parent report) were linked with reported maternal and paternal parental practices, as well as parental reports of parental practices, based on rejection and overprotection;
- Children's reports of both maternal and paternal practices based on rejection predicted children's depressive symptoms;
- The composite sum of maternal and paternal practices based on overprotection positively predicted children's general anxiety symptoms;

5.4.4. Study 4

- We a positive link between interpretive ToM – perceptual, constructivist ToM and age;
- We found a positive link between constructivist ToM (Active Mental Process explanations) and maternal and paternal practices based on warmth, affection and support, and a negative link with maternal practices based on rejection. The same was found for interpretive ToM (Droodle task);
- Our results show that age, mother's education, and mother's and father's warm parental practices predicted constructivist ToM (The Active Mental process explanations);
- Children who could interpret in two different valid ways the two ambiguous drawings (Interpretive ToM - perceptual) had higher separation anxiety symptoms than those who did not. The same was found regarding panic attack symptoms;
- Children who could interpret in two different valid ways the two ambiguous drawings (Interpretive ToM - perceptual) had lower levels of parental practices based on rejection;
- Our results show that parental practices based on rejection predicted children's internalizing symptoms.

5.5. Limitations

Some cautionary notes regarding the investigations need to be addressed. Firstly, in two studies (Study 1 and 2), our sample size was small, and it may have influenced how salient some relationships were. Secondly, even though we developed newly tasks to measure interpretive diversity understanding, we did not use other well-known ToM measures, in order to test their validity, except for Study 1 and 2. Using the paper and pencil version of the constructivist ToM interview did not seem to highlight their reasoning abilities (Study 3). It would be interesting to investigate interpretive diversity understanding when in a natural social setting. Last but not least, future studies should consider a longitudinal design, as opposed to the correlational one, in order to fully determine the causal direction between these constructs.

5.6. Practical Implications

- Practitioners can specifically work on ToM in their interventions aiming to reduce anxiety symptoms and feelings of loneliness (Caputti et al., 2020).
- A task as the developed vignettes may act as a tool for training programs aiming to improve more advanced mental reasoning, adapted to school settings (Bianco et al., 2016; Lecce et al., 2014).

- Moreover, our study furthers our knowledge on experiments done in an online format, and consequently contributes to our knowledge on adapting training programs to this virtual setting.
- In addition, training programs can be designed for parents to address their parental practices.

5.7. Final Conclusions

In conclusion, our investigations bring valuable preliminary findings regarding the interpretive diversity understanding and its relation to other individual differences, of cognitive, emotional and contextual nature. This advanced form of ToM needs to be deconstructed in different types in order to fully understand its developmental trajectory and manifestation. We propose an integrative model that comprise three different types of ToM, *the interpretive ToM – perceptual*, *the interpretive biased ToM*, and *the constructivist ToM*. Executive functions and ToM are concepts – umbrella that comprise distinctive abilities, with different developmental pathways. Their relationships changes over time, from a clear direct one found in preschool, to a more inconsistent one in middle childhood. We also found an interpretive diversity understanding deficit in anxiety. Parental practices based of warmth and affection positively influenced the ability to reason about the mind, as opposed to parental practices based on rejection and overprotection. Understanding these relationships is paramount for developing training programs for children, adapted to school setting, as well as for parents, with the aim to improve children's complex reasoning about the mind as being constructive, and elevate their emotional struggles.

References

Alegre, A., Benson, M.J., Perez-Escoda, N. (2014). Maternal warmth and early adolescents' internalizing symptoms and externalizing behavior: Mediation via emotional insecurity. *Journal of Early Adolescence, 34*(6), 712–735, DOI: 10.1177/0272431613501408.

Alfano, C. A., Beidel, D. C., & Turner, S. M. (2002). Cognition in childhood anxiety: conceptual, methodological, and developmental issues. *Clinical Psychology Review, 22*(8), 1209-1238. https://doi.org/10.1016/S0272-7358(02)00205-2

Aluja, A., Barrio, V. D., & Garcia, L. F. (2006). Do parents and adolescents differ in their perceptions of rearing styles? Analysis of the EMBU versions for parents and adolescents. *Scandinavian Journal of Psychology, 47*(2), 103-108. https://doi.org/10.1111/j.1467-9450.2006.00497.x

Austin, G., Groppe, K., & Elsner, B. (2014). The reciprocal relationship between executive function and theory of mind in middle childhood: A 1-year longitudinal perspective. *Frontiers in psychology, 5*, 655. https://doi.org/10.3389/fpsyg.2014.00655

Ahmed, F. S., & Miller, L. S. (2011). Executive function mechanisms of theory of mind. *Journal of autism and developmental disorders, 41*(5), 667-678. https://doi.org/10.1007/s10803-010-1087-7

Alfano, C. A., Beidel, D. C., & Turner, S. M. (2002). Cognition in childhood anxiety: conceptual, methodological, and developmental issues. *Clinical Psychology Review, 22*(8), 1209-1238. https://doi.org/10.1016/S0272-7358(02)00205-2

Banerjee, R., & Henderson, L. (2001). Social-cognitive factors in childhood social anxiety: a preliminary investigation. *Social Development, 10*(4), 558-572. https://doi.org/10.1111/1467-9507.00180

Baron-Cohen, S., O'riordan, M., Stone, V., Jones, R., & Plaisted, K. (1999). Recognition of faux pas by normally developing children and children with Asperger syndrome or high-functioning autism. *Journal of autism and developmental disorders, 29*(5), 407-418. https://doi.org/10.1023/A:1023035012436

Barquero, B., Robinson, E., & Thomas, G. (2003). Children's ability to attribute different interpretations of ambiguous drawings to a naive vs. a biased observer. *International Journal of Behavioral Development, 27*(5), 445-456. https://doi.org/10.1080/01650250344000064

Behbahani, F. A., Mohseni, N., Hejazi, E., & Hejazi, B. (2012). Preschool Children's Understanding of Biased Social Cognition. *Procedia-Social and Behavioral Sciences, 32*, 8-13. https://doi.org/10.1016/j.sbspro.2012.01.002

Bianco, F., Lombardi, E., Massaro, D., Castelli, I., Valle, A., Marchetti, A., & Lecce, S. (2019). Enhancing advanced Theory of Mind skills in primary school: A training study with 7-to 8-year-olds. *Infant and Child Development, 28*(6), e2155. https://doi.org/10.1002/icd.2155

Bock, A. M., Gallaway, K. C., & Hund, A. M. (2015). Specifying links between executive functioning and theory of mind during middle childhood: Cognitive flexibility predicts social understanding. *Journal of Cognition and Development*, *16*(3), 509-521. https://doi.org/10.1080/15248372.2014.888350

Bocquier, A., Cortaredona, S., Verdoux, H., Sciortino, V., Nauleau, S., & Verger, P. (2013). Social inequalities in new antidepressant treatment: A study at the individual and neighborhood levels. *Annals of Epidemiology*, *23*(3), 99-105 https://doi.org/10.1016/j.annepidem.2012.12.008

Bögels, S. M., & Brechman-Toussaint, M. L. (2006). Family issues in child anxiety: Attachment, family functioning, parental rearing and beliefs. *Clinical Psychology Review, 26*(7), 834-856. https://doi.org/10.1016/j.cpr.2005.08.001

Brumariu, L. E., & Kerns, K. A. (2010). Parent–child attachment and internalizing symptoms in childhood and adolescence: A review of empirical findings and future directions. *Development and Psychopathology*, *22*(1), 177-203. https://doi.org/10.1017/S0954579409990344

Buhlmann, U., Wacker, R., & Dziobek, I. (2015). Inferring other people's states of mind: Comparison across social anxiety, body dysmorphic, and obsessive–compulsive disorders. *Journal of anxiety disorders*, *34*, 107-113. https://doi.org/10.1016/j.janxdis.2015.06.003

Caputi, M., & Schoenborn, H. (2018). Theory of mind and internalizing symptoms during middle childhood and early adolescence: The mediating role of coping strategies. *Cogent Psychology*, *5*(1), 1487270. https://doi.org/10.1080/23311908.2018.1487270

Carpendale, J. I., & Chandler, M. J. (1996). On the distinction between false belief understanding and subscribing to an interpretive theory of mind. *Child Development, 67*(4), 1686-1706. https://doi.org/10.1111/j.1467-8624.1996.tb01821.x

Chorpita, B. F., Yim, L., Moffitt, C., Umemoto, L. A., & Francis, S. E. (2000). Assessment of symptoms of DSM-IV anxiety and depression in children: A revised child anxiety and depression scale. *Behaviour research and therapy, 38*(8), 835-855. https://doi.org/10.1016/S0005-7967(99)00130-8

Clark, D. A., & Beck, A. T. (2011). *Cognitive therapy of anxiety disorders: Science and practice*. Guilford Press.

Colonnesi, C., Nikolić, M., de Vente, W., & Bögels, S. M. (2017). Social anxiety symptoms in young children: investigating the interplay of theory of mind and expressions of shyness. *Journal of abnormal child psychology, 45*(5), 997-1011. https://doi.org/10.1007/s10802-016-0206-0

Conger, R. D., Wallace, L. E., Sun, Y., Simons, R. L., McLoyd, V. C., & Brody, G. H. (2002). Economic pressure in African American families: A replication and extension of the family stress model. *Developmental Psychology, 38*(2), 179. https://doi.org/10.1037/0012-1649.38.2.179

Connell, A. M., & Goodman, S. H. (2002). The association between psychopathology in fathers versus mothers and children's internalizing and externalizing behavior problems: a meta-analysis. *Psychological Bulletin, 128*(5), 746. https://doi.org/10.1037/0033-2909.128.5.746

Dadds, M. R. (2002). Learning and intimacy in the families of anxious children. In *The effects of parental dysfunction on children* (pp. 87-104). Springer, Boston, MA.

Darling, N., & Steinberg, L. (1993). Parenting style as context: An integrative model. *Psychological Bulletin*, *113*(3), 487. https://doi.org/10.1037/0033-2909.113.3.487

Davidov, M., & Grusec, J. E. (2006). Untangling the links of parental responsiveness to distress and warmth to child outcomes. *Child Development, 77*, 44–58. https://doi.org/10.1111/j.14678624.2006.00855.x

Derakshan, N., Ansari, T. L., Hansard, M., Shoker, L., & Eysenck, M. W. (2009). Anxiety, inhibition, efficiency, and effectiveness: An investigation using the antisaccade task. *Experimental Psychology*, *56*(1), 48-55. https://doi.org/10.1027/1618-3169.56.1.48

Devine, R. T., & Hughes, C. (2013). Silent films and strange stories: Theory of mind, gender, and social experiences in middle childhood. *Child development*, *84*(3), 989-1003. https://doi.org/10.1111/cdev.12017

Devine, R. T., White, N., Ensor, R., & Hughes, C. (2016). Theory of mind in middle childhood: Longitudinal associations with executive function and social competence. *Developmental psychology*, *52*(5), 758. https://doi.org/10.1037/dev0000105

Diamond, A. (2013). Executive functions. *Annual Review of Psychology*, *64*, 135-168. https://doi.org/10.1146/annurev-psych-113011-143750

Dinolfo, C., & Malti, T. (2013). Interpretive understanding, sympathy, and moral emotion attribution in oppositional defiant disorder symptomatology. *Child Psychiatry & Human Development*, *44*(5), 633-645. https://doi.org/10.1007/s10578-013-0357-y

Dobrean A. (coord.) (2012). Scala de inteligenţă Wechsler pentru copii – ediţia a IV-a. Romanian Psychological Testing Services.

Duh, S., Paik, J. H., Miller, P. H., Gluck, S. C., Li, H., & Himelfarb, I. (2016). Theory of mind and executive function in Chinese preschool children. *Developmental Psychology*, *52*(4), 582. https://doi.org/10.1037/a0040068

Eisbach, A. O. D. (2004). Children's developing awareness of diversity in people's trains of thought. *Child Development*, *75*(6), 1694-1707. https://doi.org/10.1111/j.1467-8624.2004.00810.x

Eysenck, M. W., & Calvo, M. G. (1992). Anxiety and performance: The processing efficiency theory. *Cognition & Emotion*, *6*(6), 409-434.https://doi.org/10.1080/02699939208409696

Field, A. P., & Lester, K. J. (2010a). Learning of information processing biases in anxious children and adolescents. In J. A. Hadwin & A. P. Field (Eds.), *Information processing biases and anxiety: A developmental perspective* (pp. 253–278). Wiley Blackwell. https://doi.org/10.1002/9780470661468.ch11

Field, A. P., & Lester, K. J. (2010b). Is there room for 'development' in developmental models of information processing biases to threat in children and adolescents? *Clinical Child and Family Psychology Review, 13*(4), 315-332. https://doi.org/10.1007/s10567-010-0078-8

Gardner, A., & Zimmer-Gembeck, M. (2018). Rejection sensitivity and responses to rejection: Serial mediators linking parenting to adolescents and young adults' depression and trait-anxiety. *Journal of Relationships Research, 9,* E9. doi:10.1017/jrr.2018.8.

Ge, X., Conger, R. D., Cadoret, R. J., Neiderhiser, J. M., Yates, W., Troughton, E., & Stewart, M. A. (1996). The developmental interface between nature and nurture: a mutual influence

model of child antisocial behavior and parent behaviors. *Developmental Psychology*, *32*(4), 574-589. doi: 10.1037/0012-1649.32.4.574

Grist, R. M., & Field, A. P. (2012). The mediating effect of cognitive development on children's worry elaboration. *Journal of Behavior Therapy and Experimental Psychiatry*, *43*(2), 801-807. https://doi.org/10.1016/j.jbtep.2011.11.002

Hadwin, J. A., & Field, A. P. (2010). An introduction to the study of information processing biases in childhood anxiety: Theoretical and methodological issues. In J. A. Hadwin & A.P. Field (Eds.), *Information processing biases and anxiety: A developmental perspective* (pp. 1-17). Wiley Blackwell. https://doi.org/10.1002/9780470661468.ch1

Hazel, D. M., & McNally, R. J. (2014). Theory of mind impairments in social anxiety disorder. *Behavior Therapy*, *45*(4), 530-540. https://doi.org/10.1016/j.beth.2014.02.010

Hudson, J. L., Comer, J. S., & Kendall, P. C. (2008). Parental responses to positive and negative emotions in anxious and nonanxious children. *Journal of Clinical Child & Adolescent Psychology*, *37*(2), 303-313.

Hughes, C., & Devine, R. T. (2019). For better or for worse? Positive and negative parental influences on young children's executive function. *Child Development*, *90*(2), 593-609. https://doi.org/10.1111/cdev.12915

Im-Bolter, N., Agostino, A., & Owens-Jaffray, K. (2016). Theory of mind in middle childhood and early adolescence: Different from before?. *Journal of Experimental Child Psychology*, *149*, 98-115. https://doi.org/10.1016/j.jecp.2015.12.006

Jakubowska, J., & Białecka-Pikul, M. (2020). A new model of the development of deception: Disentangling the role of false-belief understanding in deceptive ability. *Social Development*, *29*(1), 21-40. https://doi.org/10.1111/sode.12404

Kennedy, K., Lagattuta, K. H., & Sayfan, L. (2015). Sibling composition, executive function, and children's thinking about mental diversity. *Journal of experimental child psychology*, *132*, 121-139. https://doi.org/10.1016/j.jecp.2014.11.007

Kilinçel, Ş., Vural, A. P., & Kilinçel, O. (2020). Theory of mind deficit in adolescents with major depressive disorder. *Anadolu Psikiyatri Dergisi*, *21*(2), 158-164. http://dx.doi.org/10.5455/apd.53279

Lalonde, C. E., & Chandler, M. J. (2002). Children's understanding of interpretation. *New Ideas in Psychology*, *20*(2), 163-198. https://doi.org/10.1016/S0732-118X(02)00007-7

Lecce, S., & Bianco, F. (2018). Working memory predicts changes in children's theory of mind during middle childhood: A training study. *Cognitive Development*, *47*, 71-81. https://doi.org/10.1016/j.cogdev.2018.04.002

Lecce, S., Bianco, F., Devine, R. T., & Hughes, C. (2017). Relations between theory of mind and executive function in middle childhood: A short-term longitudinal study. *Journal of Experimental Child Psychology*, *163*, 69-86. https://doi.org/10.1016/j.jecp.2017.06.011

Lecce, S., Bianco, F., Devine, R. T., Hughes, C., & Banerjee, R. (2014). Promoting theory of mind during middle childhood: A training program. *Journal of Experimental Child Psychology*, *126*, 52-67. https://doi.org/10.1016/j.jecp.2014.03.002

Mathews, A., & Mackintosh, B. (1998). A cognitive model of selective processing in anxiety. *Cognitive therapy and research*, *22*(6), 539-560. https://doi.org/10.1023/A:1018738019346

Mazzone, L., Ducci, F., Scoto, M. C., Passaniti, E., D'Arrigo, V. G., & Vitiello, B. (2007). The role of anxiety symptoms in school performance in a community sample of children and adolescents. *BMC Public Health*, *7*(1), 1-6. https://doi.org/10.1186/1471-2458-7-347

Meinhardt-Injac, B., Daum, M. M., & Meinhardt, G. (2020). Theory of mind development from adolescence to adulthood: Testing the two-component model. *British Journal of Developmental Psychology*, *38*(2), 289-303. https://doi.org/10.1111/bjdp.12320

Miller, S. A. (2000). Children's understanding of preexisting differences in knowledge and belief. *Developmental Review*, *20*(2), 227-282. https://doi.org/10.1006/drev.1999.0501

Mills, C. M., & Elashi, F. B. (2014). Children's skepticism: Developmental and individual differences in children's ability to detect and explain distorted claims. *Journal of Experimental Child Psychology*, *124*, 1-17. https://doi.org/10.1016/j.jecp.2014.01.015

Moldovan, M., Seucan, D. T., & Visu-Petra, L. (2020). Pre-and post-theory of mind and deception: Commentary on Walczyk and Fargerson (2019). *New Ideas in Psychology*, *56*, 100754. https://doi.org/10.1016/j.newideapsych.2019.100754

Moldovan, M., & Visu-Petra, L. (2022). Theory of Mind, Anxiety, and Interpretive Bias During Middle Childhood. *Journal of Child and Family Studies*, *31*(1), 99-113. https://doi.org/10.1007/s10826-021-02023-0

Moses, L. J. (2001). Executive accounts of theory-of-mind development. *Child Development*, *72*(3), 688-690. https://doi.org/10.1111/1467-8624.00306

Muris, P., Meesters, C., & van den Berg, S. (2003). Internalizing and externalizing problems as correlates of self-reported attachment style and perceived parental rearing in normal adolescents. *Journal of Child and Family Studies*, *12*(2), 171-183. https://doi.org/10.1023/A:1022858715598

Muris, P., Meesters, C., & van Brakel, A. (2003). Assessment of anxious rearing behaviors with a modified version of "Egna Minnen Beträffande Uppfostran" questionnaire for children. *Journal of Psychopathology and Behavioral Assessment*, *25*(4), 229-237. https://doi.org/10.1023/A:1025894928131

Nikolić, M., van der Storm, L., Colonnesi, C., Brummelman, E., Kan, K. J., & Bögels, S. (2019). Are Socially Anxious Children Poor or Advanced Mindreaders? *Child development*, *90*(4), 1424-1441. https://doi.org/10.1111/cdev.13248

Ooi, Y. P., Lam, C. M., Sung, M., Tan, W. T. S., Goh, T. J., Fung, D. S. S., ... & Chua, A. (2008). Effects of cognitive-behavioural therapy on anxiety for children with high-functioning autistic spectrum disorders. *Singapore Medical Journal*, *49*(3), 215-220.

O'Reilly, J., & Peterson, C. C. (2014). Theory of mind at home: Linking authoritative and authoritarian parenting styles to children's social understanding. *Early Child Development and Care*, *184*(12), 1934-1947. https://doi.org/10.1080/03004430.2014.894034

Osterhaus, C., Koerber, S., & Sodian, B. (2016). Scaling of advanced theory-of-mind tasks. *Child development*, *87*(6), 1971-1991. https://doi.org/10.1111/cdev.12566

Öztürk, Y., Özyurt, G., Turan, S., Mutlu, C., Tufan, A. E., & Akay, A. P. (2020). Association of theory of mind and empathy abilities in adolescents with social anxiety disorder. *Current Psychology*, 1-10. https://doi.org/10.1007/s12144-020-00707-2

Pavarini, G., de Hollanda Souza, D., & Hawk, C. K. (2013). Parental practices and theory of mind development. *Journal of Child and Family Studies*, *22*(6), 844-853. https://doi.org/10.1007/s10826-012-9643-8

Pellicano, E. (2007). Links between theory of mind and executive function in young children with autism: clues to developmental primacy. *Developmental Psychology*, *43*(4), 974. https://doi.org/10.1037/0012-1649.43.4.974

Perner, J., & Roessler, J. (2010). Teleology and causal understanding. In J. H. Aguilar & A. A. Buckareff (Eds.), Causing human action: New perspectives on the causal theory of action (pp. 199–228). Cambridge, MA: MIT Press.

Plana, I., Lavoie, M. A., Battaglia, M., & Achim, A. M. (2014). A meta-analysis and scoping review of social cognition performance in social phobia, posttraumatic stress disorder and other anxiety disorders. *Journal of Anxiety Disorders*, *28*(2), 169-177. https://doi.org/10.1016/j.janxdis.2013.09.005

Pillow, B. H. (1991). Children's understanding of biased social cognition. *Developmental Psychology*, *27*(4), 539. https://doi.org/10.1037/0012-1649.27.4.539

Pillow, B. H. (2008). Development of children's understanding of cognitive activities. *The Journal of Genetic Psychology*, *169*(4), 297-321. DOI: 10.3200/GNTP.169.4.297-321

Pillow, B. H., & Mash, C. (1998). Children's understanding of misinterpretation: Source identification and perspective-taking. *Merrill-Palmer Quarterly* (1982-), 129-140. https://www.jstor.org/stable/23093662

Rapee, R. M. (1997). Potential role of childrearing practices in the development of anxiety and depression. *Clinical Psychology Review*, *17*(1), 47-67. https://doi.org/10.1016/S0272-7358(96)00040-2

Reddy, V. (2007). Getting back to the rough ground: Deception and "social living". *Philosophical Transactions of the Royal Society of London B: Biological Sciences*, 362, 621–637. https://doi.org/10.1098/rstb.2006.1999

Reid, S. (2017). What am I thinking right now? Social anxiety symptomology and its impact on theory of mind ability. Retrieved from https://digitalcommons.butler.edu/ugtheses/409/

Rose, J., Roman, N., Mwaba, K., & Ismail, K. (2018). The relationship between parenting and internalizing behaviours of children: A systematic review. *Early Child Development and Care*, *188*(10), 1468-1486. https://doi.org/10.1080/03004430.2016.1269762

Ross, H. S., Recchia, H. E., & Carpendale, J. I. (2005). Making sense of divergent interpretations of conflict and developing an interpretive understanding of mind. *Journal of Cognition and Development*, *6*(4), 571-592. https://doi.org/10.1207/s15327647jcd0604_7

Sabbagh, M. A., Xu, F., Carlson, S. M., Moses, L. J., & Lee, K. (2006). The development of executive functioning and theory of mind: A comparison of Chinese and US preschoolers. *Psychological Science*, *17*(1), 74-81. https://doi.org/10.1111/j.1467-9280.2005.01667.x

Scaini, S., Caputi, M., Ogliari, A., & Oppo, A. (2020). The Relationship Among Attributional Style, Mentalization, and Five Anxiety Phenotypes in School-Age Children. *Journal of*

Research in Childhood Education, *34*(4), 551-565. https://doi.org/10.1080/02568543.2019.1710729

Schaafsma, S. M., Pfaff, D. W., Spunt, R. P., & Adolphs, R. (2015). Deconstructing and reconstructing theory of mind. *Trends in Cognitive Sciences, 19(2),* 65–72. https://doi.org/10.1016/j.tics.2014.11.007

Slaughter, V., Imuta, K., Peterson, C. C., & Henry, J. D. (2015). Meta-analysis of theory of mind and peer popularity in the preschool and early school years. *Child development*, *86*(4), 1159-1174. https://doi.org/10.1111/cdev.12372

Sodian, B., & Kristen, S. (2010). Theory of mind. In B. M. Glatzeder, V. Goel, & A. von Muller (Eds.), *Towards a theory of thinking* (pp. 189-201). Berlin: Springer-Verlag.

Stuijfzand, S., Creswell, C., Field, A. P., Pearcey, S., & Dodd, H. (2018). Research Review: Is anxiety associated with negative interpretations of ambiguity in children and adolescents? A systematic review and meta-analysis. *Journal of Child Psychology and Psychiatry, 59*(11), 1127-1142. https://doi.org/10.1111/jcpp.12822

Suarez, L., & Bell-Dolan, D. (2001). The relationship of child worry to cognitive biases: Threat interpretation and likelihood of event occurrence. *Behavior Therapy, 32*(3), 425-442. https://doi.org/10.1016/S0005-7894(01)80029-0

Tafreshi, D., & Racine, T. P. (2016). Children's interpretive theory of mind: The role of mothers' personal epistemologies and m other-child talk about interpretation. *Cognitive Development, 39*, 57-70. https://doi.org/10.1016/j.cogdev.2016.04.003

Vetter, N. C., Altgassen, M., Phillips, L., Mahy, C. E., & Kliegel, M. (2013). Development of affective theory of mind across adolescence: Disentangling the role of executive functions. *Developmental Neuropsychology*, *38*(2), 114-125. https://doi.org/10.1080/87565641.2012.733786

Visu-Petra, L., Cheie, L., Benga, O., Alloway, T. P. (2011). Effects of anxiety on memory storage and updating in young children. *International Journal of Behavioral Development, 35*(1) 38–47. DOI: 10.1177/0165025410368945

Wechsler, D. (2014). *WISC-V: Technical and interpretive manual*. NCS Pearson, Incorporated.

Wellman, H. M., Cross, D., & Watson, J. (2001). Meta-analysis of theory-of-mind development: The truth about false belief. *Child development, 72*(3), 655-684. https://doi.org/10.1111/1467-8624.00304

Weimer, A. A., Dowds, S. J. P., Fabricius, W. V., Schwanenflugel, P. J., & Suh, G. W. (2017). Development of constructivist theory of mind from middle childhood to early adulthood and its relation to social cognition and behavior. *Journal of Experimental Child Psychology*, *154*, 28-45. https://doi.org/10.1016/j.jecp.2016.10.002

Weimer, A. A., Warnell, K. R., Ettekal, I., Cartwright, K. B., Guajardo, N. R., & Liew, J. (2021). Correlates and antecedents of theory of mind development during middle childhood and adolescence: An integrated model. *Developmental Review*, *59*, 100945. https://doi.org/10.1016/j.dr.2020.100945

White, S., Hill, E., Happé, F., & Frith, U. (2009). Revisiting the strange stories: Revealing mentalizing impairments in autism. *Child development*, *80*(4), 1097-1117. https://doi.org/10.1111/j.1467-8624.2009.01319.x

White, L. O., Klein, A. M., von Klitzing, K., Graneist, A., Otto, Y., Hill, J., Over, H., Fonagy, P., & Crowley, M. J. (2016). Putting ostracism into perspective: Young children tell more mentalistic stories after exclusion, but not when anxious. *Frontiers in psychology*, *7*, 1926. https://doi.org/10.3389/fpsyg.2016.01926

Williams, S., Moore, K., Crossman, A. M., & Talwar, V. (2016). The role of executive functions and theory of mind in children's prosocial lie-telling. *Journal of Experimental Child Psychology*, *141*, 256-266. https://doi.org/10.1016/j.jecp.2015.08.001

Zelazo, P. D., & Carlson, S. M. (2012). Hot and cool executive function in childhood and adolescence: Development and plasticity. *Child development perspectives*, *6*(4), 354-360. https://doi.org/10.1111/j.1750-8606.2012.00246.x