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ADVANCED THEORY OF MIND AND EXECUTIVE FUNCTIONS DURING MIDDLE CHILDHOOD

MELANIA MOLDOVAN[1], ANDRA DIANA COMAN[2], LAURA VISU-PETRA[1*]

ABSTRACT. The understanding of the mind and its relation with cognitive abilities during middle childhood is still limited. One dimension of it, the interpretive diversity understanding, represents an understanding that people can have different interpretations of the same situation due to differences in their beliefs, attitudes, and knowledge. We aim to investigate, for the first time in literature, three dimensions of advanced *theory of mind* (ToM): faux-pas understanding, strange stories and *interpretive ToM*, in relation with *executive functions* (working memory, inhibition and switching), in an emotional framework (anxiety symptoms) during *middle childhood* (9-12 years). Results revealed that the three ToM abilities did not correlate with each other, and only strange stories correlated with inhibition and switching. On the other hand, the total ToM score based on the three measures was predicted by working memory and comprehension. These results support the approach to ToM as a non-coherent construct in middle childhood, and the need for further research that looks at the subdimensions included under the executive functions and ToM umbrella. Understanding the relationship between ToM dimensions, as well their interdependence with executive functions is essential for preventing early social and cognitive difficulties during middle childhood.

Keywords: *theory of mind, interpretive theory of mind, executive functions, middle childhood*

The ability to reason about the mind, to infer another individual's mental activity (e.g., beliefs, desires), to interpret and predict behavior is called theory of mind (ToM; Wellman et al., 2001). This widely researched ability is best known for the first order ToM that appears at around the age of 4 years, and

[1] Research in Individual Differences and Legal Psychology (RIDDLE) Lab, Department of Psychology, Babeş-Bolyai University, Cluj-Napoca, Romania
[2] Department of Psychology, Babeş-Bolyai University, Cluj-Napoca, Romania
[*] Correspondence concerning this article should be addressed to Laura Visu-Petra, Dept. of Psychology, Babeş-Bolyai University, Republicii Street, nr. 37, Cluj-Napoca, 400015. Email: laurapetra@psychology.ro. Laura Visu-Petra https://orcid.org/0000-0001-6905-9279

reflects the understanding that people can hold diverse beliefs, different from their own and reality, and act upon it (Wellman et al., 2001). As they age, children become increasingly better at inferring complex mental states, relation between beliefs, emotions and behaviors, as well as understanding ambiguous social situations (Millers, 2000; White et al., 2009). Advanced ToM improves throughout middle childhood into adolescence and adulthood (Dumontheil et al., 2010), playing a paramount role in a healthy development. Research up to date supports ToM associations with peer acceptance (Slaughter et al., 2015), prosocial behavior and general social competence (Devine et al., 2016). There is extensive research on ToM in preschoolers, compared with the paucity of knowledge during middle childhood (Hughes & Devine, 2015). The contradicting findings in the literature indicate the possibility of a multi-process ToM during this age frame (Schaafsma et al., 2015). The term ToM could denote an umbrella for complex abilities that have a differential progression (Osterhaus et al., 2016), and relate differently to other important cognitive and contextual factors (Weimer et al., 2021).

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). Designed originally for an autistic population (Happé, 1994), it has been used since then in typically developing middle childhood (Lecce et al. 2014), as well as adolescent populations (Caputi & Schoenborn, 2018; White et al., 2009). It not only deals with children's belief understanding, but also with 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 ToM*, also included under the interpretive diversity understanding umbrella (Millers, 2000). Over the years, children gradually understand that inferring another person's belief requires not only consideration to their access to information (first order ToM), but also to their active constructivist mind processes (Millers, 2000; Pillow, 1991, 1995). Therefore, people can form different interpretations of the same situation due to their prior subjective experience, beliefs and attitudes (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; Miyake et al., 2000; Zelazo & Muller, 2011). These

cognitive processes underlie emotional, thought and behavioral regulation (Diamond, 2013; Rueda et al., 2012). They support the supervision of the ongoing behavioral and thought process, adjusting to current goals and new information when necessary, as well as implementing a behavioral plan while inhibiting a non-desirable response (Diamond, 2013). The relation between EF and ToM has been widely supported, especially in preschoolers, as ToM emergence has been documented to heavily rely on EF (Carlson & Moses, 2001; Devine & Hughes, 2014). However, it is still unclear how EF contribute to the developmental changes in ToM across middle childhood, if and how their relationship changes compared to earlier years (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 associated with ToM in middle childhood, as well as longitudinally predicting it one year later (Austin et al., 2014). On the other hand, others found only concurrent links between ToM and EF (Devine et al., 2016), underlying the idea that these abilities develop in tandem (Wilson et al., 2018). Moreover, a conversational-based training on ToM was most beneficial for children with higher WM, supporting the theory that EF help children to advance in their ToM abilities, by allowing them to follow conversations, operate with knowledge, and different points of view (Lecce & Bianco, 2018). Researchers emphasize the need to evaluate each EF ability separately in relation with ToM (Weimer et al., 2021). Differential results on the relation between EF and ToM might emerged as a function of task demands, as the three tasks are inherently different. 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 reduced (Authors, 2021).

Current Studies

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 a 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 measurements would positively correlate. Secondly, we hypothesized that each EF would positively predict ToM abilities, as well as the Total ToM. Basic abilities for belief reasoning have already been acquired, and the complexity of advanced ToM may be driven by further EF development. 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.

Method

Participants and Procedure

We recruited 120 primary school children with ages between 9-12 years (*M* = 124.02 months, *SD* = 12.23) from a public school in a northwestern part of XXX. 97% of the families declared XXX as the primary language, and 80% declared their household earnings above minimum wage (National Institute of Statistics, 2021). Their parent's education varied, most of them having finished a bachelor degree (56% of mothers and 45,8 % of fathers; the national average was of approximately 26.3% in 2017; European Commission Romania, 2021).

We included children from schools with the help of the teachers. We initially approached parents from 16 classes, from which approximately 25% agreed to participate. Caregivers' consent and children's verbal assent were necessary for inclusion, and children were free to withdraw from the study or decline to complete any task at any point.

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 (6 different task order sequences with 20 children per type) in order to distribute evenly any sequence effect. The time between the two phases varied between 1 week and 1 month. An initial a

priori analysis for the upcoming correlational analysis was conducted with G*power (Faul et al., 2017) and revealed that with α = .05 and a power 1−β = .80, we needed 75 participants in order to find effects of 0.25.

Baseline Measurement

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.

Anxiety Symptoms Measurement

The Revised Child Anxiety and Depression Scale-Parent Versions (RCADS)

RCADS (Authors, 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.

Executive Functions Measurements

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). More specifically, the base span was taken as the highest list length, where at least four trials our of six were correct, to which a score of 0.167 (1/6 trials) is added for every higher list length trial that was correctly recalled. Hence, for example, if a child correctly recalled 6 trials of three-word lists, and 3 four-word lists, an aggregate span of 3 + 3*0.167 = 3.501 was computed.

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.

ToM Measurements

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 depicting realistic social situations, each followed by a single question in an open format regarding the understanding of the intention and motive behind the character's behavior (White et al., 2009). Due to time constraints, we selected four of the eight available vignettes: one double bluff, a white lie, a deception and a misunderstanding story. The experimenter read the stories to the child and wrote down their answer. The stories were read again if necessary, which many of the children asked to. The responses were coded on a 3-point scale reflecting the degree of the understanding of the characters' mental states, with 0 - failed understanding, 1 - partial understanding and 2 – full understanding. 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). More specifically, a Faux Pas Detection Question ("In the story did someone say something that they should not have said?"), an Identification Question ("What did they say that they should not have said?"), a Comprehensive Question, and a False Belief Question (to recognize that the faux pas was a consequence of a false belief). If the child

succeeded in recognizing that a faux-pas was present in the story, the second question, regarding the faux-pas content, was addressed. 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 ToM (adapted from Pillow, 1991; Pillow & Weed, 1995)

We adapted 4 stories from Pillow (1991) and Pillow and Weed (1995). These stories were simplified, compared with the one of Pillow (1991)'s, in order to ensure comprehension (number of characters with biased beliefs, fewer questions). The stories had one character and an actor. The character had two biased beliefs about the actor (e.g., "*Dan thinks Sergiu likes to share toys with other kids. And Dan thinks sometimes Sergiu doesn't listen to what the teachers tell them to do*"), 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 ("*While he was alone in the classroom, Sergiu saw the rabbit jump out of its cage. Sergiu picked the rabbit up. Dan came into the classroom and saw Sergiu holding the rabbit in front of the cage. Dan didn't see the rabbit jump out of the cage.*"). We intersected two conditions, *nature of ambiguity and contrasting valences,* following the structure of the stories used in Experiment 2 in Pillow and 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 (1 story relevant positive bias, negative reality; 1 story relevant negative bias, positive reality) or not (1 story relevant positive bias, positive reality; 1 story relevant negative bias, negative reality; see Appendix A).

The experimenter asked a bias memory question ("What does Dan think about Sergiu? What more does he think about Sergiu?"), an event memory question ("What did Sergiu do?"), an access to knowledge question ("Did Dan see what happened in the classroom?"), and an interpretation question ("What does Dan think Sergiu is doing? Does Dan think that Sergiu is taking the rabbit out of its cage or does Dan think that Sergiu is putting the rabbit back in its cage?"). If the children did not correctly answer one of the memory questions, the story was read again. The order of choices in the last question was counterbalanced. The stories were presented in a random order. The characters were female in half of the stories in each condition and male in the other half.

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.

Design and Analytical Strategy

Firstly, the descriptive statistics of each outcome was examined. In order to deal with missing data we have used E - M (expectation maximum likelihood) approach. This approach is more robust than the imputations methods and has good statistical properties (for more informations see Jakobsen et al., 2017). The normality of each distribution was examined in order to choose between the parametrical or non-parametrical tests. Secondly, we applied the correlation and regression analysis in order to test for our hypothesis regarding the relations between our constructs.

Results

Descriptive data for the three ToM tasks, Total ToM, EF, anxiety symptoms and comprehension are provided in Table 1. Regarding the demographic data, we obtained a positive correlation between Total ToM and Age, $r_s(120) = .24$, $p = .006$, as well as Income, $r_s(120) = .24$, $p = .006$ (see Table 2). This means that children performed better on the ToM tasks, they were also older and their parents had a higher financial status.

Table 1. Descriptive statistics for the main variables

Variable	*N*	*Range*	*Min*	*Max*	*M*	*SD*
Comprehension	120	39	14	53	35.76	6.58
Anxiety and depression symptoms						
Anxiety Symptoms	120	53	2	55	16.6	9.75
Internalizing Symptoms	120	59	2	61	19.98	11.63
IQ tests						
Working Memory	120	4.83	1.17	6	3.30	.77
Inhibition Efficiency	120	3.98	0	3.98	2.17	.75
Switching Efficiency	120	4.72	0	4.72	2.55	.83
Faux-pas task	120	4	0	4	2.73	1.12
Strange Stories task	120	6	2	8	5.41	1.59
Interpretive ToM	120	4	0	4	2.35	.81
Total ToM	120	11	4	15	10.49	2.25

Note: Anxiety and Internalizing Scores are outcomes of the Revised Child Anxiety and Depression questionnaire completed by children and their parents. Inhibition and Switching Efficiency are two subscales from the Processing Speed Index.

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, $r_s(120) = .19$, $p = .033$. This means that as children performance on correctly inferring the character's interpretation based on their relevant bias, in stories where the valence was consistent, their performance on switching between rules while doing a task increased as well. Also, in stories where the character's irrelevant bias wasn't of the same valence as the reality information, as children correctly inferred the character's interpretation based on their relevant bias, their performance on understanding transgressions of social norms increased. However, the correlations became insignificant after controlling for Age.

Regarding the relation between EF and socio-cognitive abilities, we obtained positive correlations between Total ToM and Comprehension, $r_s(120) = .28$, $p = .002$, as well as WM, $r_s(120) = .24$, $p = .007$. This means that as children answered with more correct responses on the ToM tests, they offered more correct responses regarding general principles and knowledge in various social situations, as well. They could also remember more words while doing another mental operation.

We also found significant correlations between Inhibition/ Switching Efficiency, and Comprehension, $r_s(120) = -.27$, $p = .003$, and $r_s(120) = -.26$, $p = .003$. This means that as children performed better on inhibiting unnecessary mental content, and switching between rules, they also offered more correct responses on the comprehension task. Also, as their age increased, their performance on the inhibition and switching task increased as well (see Table 2). Regarding the relation with ToM tasks, we found a significant correlation between Inhibition/Switching Efficiency and Strange Stories performance, $r_s(120) = -.19$, $p = .037$, and $r_s(120) = -.18$, $p = .041$. This means that as children performed better on inhibiting unnecessary mental content, and switching between rules, they performed better in understanding that a character's interpretation of a message influence their reaction.

In order to determine the specific effect of EF on Total ToM, while controlling for Age and Income, we ran a series of robust 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, β = .074, p = .042, *CI* [.002; .146] (see Table 3).

Table 2. Correlations between Total ToM, RCADS, and EF measures

Variable	1	2	3	4	5	6	7	8	9
1. Age									
2. Income	.13								
3. Comprehension	.51**	.15							
4. Anxiety Symptoms	-.04	-.12	.98**						
5. Internalizing Symptoms	-.01	-.12	-.19*	.01					
6. Inhibition Efficiency	-.52**	-.18*	-.27**	.04	.03				
7. Switching Efficiency	-.52**	-.11	-.26**	.06	.04	.87**			
8. Working Memory	.33**	.02	-.01	.46**	-.16	-.29**	-.18*		
9. Total ToM	.24**	.24**	.28**	.24	.00	-.00	-.01	.24**	

Note: RCADS= Revised Child Anxiety and Depression Subscale for anxiety symptoms. Significance level: *p<.05. **p<.01.

Table 3. Hierarchical Regression Analysis for Variables Predicting Total ToM

Variable	*B*	*SE B*	β	*p*	95% CI
Step 1					
Age	.51	.20	.23	.01	[.13, .90]
Income	.49	.28	.18	.07	[.01, 1.12]
Step 2					
Age	.51	.24	.12	.27	[-.25, .74]
Income	.49	.27	.16	.11	[-.04, 1.04]
WM	.12	.24	.04	.58	[-.37, .61]
Comprehension	.07	.03	.21	.04	[.00, .14]

Discussion

The literature on ToM beyond preschool years is still inconclusive. We aimed to address these shortcomings by investigating the relation between advanced ToM tasks, as well as the role played by cognitive skills in the expression of advanced ToM in middle childhood, for the first time in literature reunited in a unitary design. It is still unclear which EF is relevant for ToM in late childhood, and in what way.

We did not find any correlations between the ToM tasks, as well as between the interpretive ToM task and EF. This is not necessarily 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). Different tasks may tap different aspects of socio-cognitive reasoning and understanding, each following different developmental paths, and relying on different aspects of cognitive processes (Osterhaus et al., 2016). However, when we looked separately at the interpretive ToM conditions pertaining to the contrasting bias-reality valence, we found a positive correlation between interpretive ToM valence inconsistency condition and faux-pas understanding, and between interpretive ToM valence consistency condition and Switching Index, although they were insignificant once the age was taken into account.

As Schaafsma et al. (2015) explained, ToM reflects a variety of sub-skills, and it would paint a more realistic view if we deconstructed it into simpler processes. We followed their suggestions with the intention to explain our results. In our interpretive ToM stories, to infer the perspective of the observer, the child considers two opposite biases towards the actor (Behbahani et al., 2012). The child must consider the content of the biases in order to determine which one is relevant for the presented situation (Pillow & Weed, 1995). In order to answer correctly, they must make use of more than a valence-matching strategy between their biases and the available information. 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. Moreso, as the biases are not at the opposites in the same domain, but in different ones ("*Dan thinks Sergiu likes to share toys with other kids. And Dan thinks sometimes Sergiu doesn't listen to what the teachers tells them to do*."). It seems that the child had to make use of their imagination more than in the other ToM tasks, given the details, hence, this ability may be a confound factor in this study.

With regards to the role EF have in ToM variance, we have found WM to be a predictor of Total ToM. These results are in line with other studies that found EF to be associated with ToM at 6-11 years, as well at 7-12 years. More specifically, WM was a longitudinal predictor of a Total ToM score (second order false belief, Strange Stories task, and extended ToM scale; Austin et al., 2014). The lack of associations between Total ToM and Inhibition, Switching and Comprehension, are in line with other studies that did not find associations between EF (WM, shifting, interference control, reading comprehension) and ToM (Strange Stories task) during school years (Bianco et al., 2019; Lecce et al., 2017). These results emphasize the necessity to asses each EF subcomponent individually when considering its role in ToM expression or development. EF, as ToM, is considered an umbrella for a structure of processes, with a diversity that heightens across development (Shing et al., 2010). The relationship in literature 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).

A final cautionary note relates to the specifics of administering the ToM tasks in an online format – which might affect the children's responses and their interrelationships with EF. For example, in another online study, using an adult sample, the computerized Strange Stories task and Reading in the Eyes Task did not correlate, aligning with the idea that ToM should not be treated as a single construct (Navarro, 2021).

Conclusions

Our current study significantly contribute to the existing literature by considering a broader palette of ToM abilities in middle childhood. We used, for the first time in literature, a modified ToMi task, in relation with other well-established advanced ToM tasks. This is the first study to investigate together the three ToM abilities: interpretive ToM, Strange Stories and Faux-pas understanding. We are also looking at how inhibition, shifting, WM and comprehension interact with ToM. We found fewer significant correlation than we expected, and this could be due to the online task administration or to the complexity of these multifaceted constructs during middle childhood.

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Appendix A

Positive relevant bias, positive reality

Vlad thinks that Radu always keeps his things neat and clean. And Vlad thinks that Radu is mean to the other kids. One day, when Vlad was outside during the recess, another kid from the class spilled juice and cookies all over the table. Radu said "I will clean the mess". In that moment, Vlad came back in the classroom and saw Radu above the table, and the juice and cookies spiled all over the table. Vlad didn't see Radu spill the juice and cookies.

Negative relevant bias, negative reality

Sara thinks that Liana always listens to what the teachers tells them to do, And Sara thinks that Liana doesn't like to share her stuff with other children. One day, Liana brought a toy to the school. After a while, another girl came and took Liana's toy and started to play with it, without her permission. When Sara was outside during the recess, Liana went to that girl's desk and pushed her pencil case on the ground. Then Sara entered the classroom and saw Liana near the desk and the pencil case falling. Sara did not see Liana pushing the pencil case.

Positive relevant bias, negative reality

Iulia thinks that Andra wants to be liked by all the other kids. And Iulia thinks Andra always makes things messy and dirty. One day when Iulia was outside, Andra threw another girl's toy airplane on the floor and broke it. Then Iulia came inside, and saw Andra and the airplane on the ground. The airplane was broken. Iulia did not see Andra breaking the airplane.

Negative bias, positive reality

Dan thinks Sergiu likes to share his things with the other kids. And Dan thinks Sergiu sometimes do not listen to what the teacher is telling them to do. One day the teacher brought a rabbit to school. The teacher told the children not to take the rabbit out of its cage. During recess, all of the children went outside except Sergiu. Sergiu stayed inside. While he was alone in the classroom, Sergiu saw the rabbit jump out of its cage. Sergiu picked the rabbit up. Dan came into the classroom and saw Sergiu holding the rabbit in front of the cage. Dan did not see the rabbit jump out of the cage.