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FACULTY OF PSYCHOLOGY AND EDUCATIONAL SCIENCES
DOCTORAL SCHOOL "APPLIED COGNITIVE PSYCHOLOGY"

Individual differences in past and future oriented thinking: A developmental perspective

PHD THESIS

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2020

Cluj-Napoca

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Keywords: autobiographical memory, executive functioning, working memory, episodic future thinking, valence, prospective memory, anxiety, depression, children, adults

ACKNOWLEDGEMENTS

I would like to thank my PhD scientific supervisor, Assoc. prof. dr. habil. Laura Visu-Petra for her major contribution to this thesis during all these years and for her constant support. 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.

Also, I would like to thank dr. Lavinia Cheie for her valuable support in assisting with the methodological design of this thesis as well as data analysis and manuscript elaboration and for offering continuous feedback and insight into the scientific writing process.

Furthermore, I would like to express my gratitude to my doctoral guidance committee, prof. Mircea Miclea, prof. Oana Benga and dr. Lavinia Cheie, for their valuable feedback, recommendations, and support throughout these years.

I would also like to express appreciation to my colleagues dr. Oana Mărcuş and PhD candidate Monica Buta from RIDDLE Lab (Research In Individual and Legal Psychology Lab) for their moral support and valuable advice and to PhD candidate Oana Stanciu for her contribution regarding data analysis.

Additionally, I thank all my colleagues from the Developmental Psychology Lab and the RIDDLE Lab for their 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: Cristina Trifan, Angela Ursan, Şerban Boboş, Mădălina Caraveţeanu, Diana Constantinescu, Amalia Siminiceanu, Ioana Iuga, Andra Griga.

Also, I would like to express my gratitude to the children and adults who kindly accepted to take part in this study and to the kindergartens, schools and adult daily care centers that offered access to participants as well as logistical assistance.

In the end, I would like to thank my husband, my family and friends for their constant support and encouragement throughout these years and for being alongside me in this journey.

CHAPTER 1

Episodic future thinking: early development and relation with anxiety and depression symptoms[1]

Introduction

During the last decade, research on future oriented abilities has seen an intense development, with the focus on *episodic future thinking* becoming an important topic of investigation (Schacter, Benoit, & Szpunar, 2017). While, research has targeted at first adults, more recently an interest has grown for the investigation of future thought in children (Atance, 2018) and animals (Redshaw & Bulley, 2018).

Episodic future thinking (EFT), is a type of prospection (Szpunar, Spreng, & Schacter, 2014) that allows us to construct future scenarios based on previous personal experiences (Ferretti et al., 2018). Based on the definition proposed by Atance and O'Neill (2001), episodic future thinking represents the ability to imagine personal future events. Therefore, the individual projects oneself into the future in order to "pre-experience" an event beforehand. Other researchers however (Suddendorf, Nielsen, & Von Gehlen, 2011) argue that the envisioned scenario should be in reply to a new event that was not necessarily experienced before, as confounding variables such as learning through association might contaminate the foresight ability. In this light, a revealing example is the one proposed by Atance (2018). The researcher argued that a child that brings his shovel and bucket to play in the sand might do this action due to multiple past instances when he performed the same behavior, whereas bringing the same objects (shovel and bucket) to a new place (e.g. pond) to catch some tadpoles, might represent a behavior more indicative of foresight.

The *Constructive Episodic Simulation* (Schacter & Addis, 2007) theory states that there is an overlap between imagining future events and recalling past experiences, with evidence showing the activation of the default mode network when participants are asked to do either tasks (Addis, Wong, & Schacter, 2007).

[1] Part of this chapter has been already published as Visu-Petra, L. & Opris, M.A. (2019) Episodic future thinking: early development and relation with anxiety and depression symptoms. In Buchwald, Moore, Kaniasty, & Arenas-Landgrave (Eds.), Stress and Anxiety: Contributions of the STAR Award Winners (pp. 111–123). Berlin: Logos.

Definition of concepts

As we previously mentioned, a significant part of the existing research that investigated future thinking is related to the process of future event *simulation* (Schacter et al., 2017). Delineating between the types of knowledge required to simulate a future event, Szpunar and colleagues (2014) have defined *episodic simulation* as "the construction of a detailed mental representation of a specific autobiographical future event", whereas semantic simulation was defined as „the construction of a detailed mental representation of a general or abstract state of the world".

Development and assessment of episodic future thinking

Children's episodic future thinking develops intensively during the preschool years (Atance & Sommerville, 2014) and continues to improve until middle childhood (Ferretti et al., 2018) and adolescence (Gott & Lah, 2014). First attempts to study this ability looked at children aged 3-5 years and tried to investigate how preschoolers imagined future events using *verbal* methodologies, in which children or adults (see Miloyan & McFarlane, 2018, for a review) were encouraged to construct future events based on given word cues, or on their own generated choice of personal events. Such narrative tasks usually employ word cuing paradigms (Terrett et al., 2016) and measure the frequency, content or phenomenological characteristics of episodic future thought. In contrast, behavioral methods (Tulving, 2005) are focused more on studying anticipatory acts in view of fulfilling a certain future need. Therefore, we can say that in these tasks, the focus is on eliciting behaviors from children in order to solve anticipated future problems. An important issue in such tasks is assuring that children's behavior reflects his desire to fulfill a future need.

Verbal methods

Early research investigating this foresight ability mainly employed verbal methods. One of the most direct approaches was to ask about foreseeable future events. Following this approach, Busby and Suddendorf (2005) used the verbal method to study episodic future thinking in preschoolers, by asking children to think about an event that will happen the next day and to try to describe it. The researchers reported that 3-year-olds had more difficulty to

build accurate future events (rated by parents as likely to happen the next day), as compared to 4- and 5 year olds, who managed to create more realistic future events. Also, children's ability to respond to a question regarding what they did the previous day was related to their accuracy in imagining what they will do tomorrow. In conclusion, employing verbal methods to study foresight showed that past and future narratives were related.

Behavioral methods

In order to address several potential limitations of the verbal methodology in investigating future thinking in children, such as the difficulty to understand temporal terms (e.g. yesterday, tomorrow), that is still under intense development during the preschool years (Grant & Suddendorf, 2010), researchers have designed behavioral methods to assess this prospective ability in the form of choice or location tasks (see Atance & Mahy, 2016; Suddendorf, 2017, for reviews). This assessment approach started from Tulving (2005)'s idea of the "spoon test" in which a little girl dreams of a chocolate pudding that she cannot eat because she doesn't have a spoon. In a prospective fashion, she prepares the next evening for bedtime by putting a spoon underneath her pillow, in order to have a second chance at eating the dessert. The most popular paradigm based on this "spoon" situation is to show children a problem in one room and after a delay create the context in which they can solve the problem in a second room.

An example of a study employing this behavioral method is the research conducted by Suddendorf, Nielsen, and Von Gehlen (2011) with preschoolers. Children (3-, 4- year olds) were shown a box that could be opened only by using a triangular key to find a sticker reward inside. Using two conditions, instant or delayed (15 minutes delay), children were presented with another box which had a square keyhole, and were told that the triangular key was no longer useful for them to open the box. In the *instant* condition, children could immediately choose from three keys (square, circle, star) the correct one, without having direct visual access to the box. In the *delayed* condition, after playing in another room for 15 minutes, they were asked to choose from the three options, the key that they wanted to return with to the initial room where they left the box, without being explicitly reminded about the box. Results indicated that in the *instant* condition, both age groups managed to choose the correct item above chance levels. In the *delayed* condition, only 4 year olds matched this above change level,

however their performance was less successful in this condition compared to the instant one. The authors reported that it was the temporal delay that made this task more difficult. Also, memory seems to play an important role in children's foresight performance. For example, if children failed to remember which shape was the correct one for the key, they would fail to secure the right solution for the future problem of a closed box.

Another closely related ability to episodic future thinking is prospective memory. Both abilities are very important to school adjustment and everyday functioning.

Prospective memory

Prospective memory (PM) refers to the ability to remember to do a planned action at the appropriate time in the future (McDaniel & Einstein, 2007). In terms of tasks used to assess PM performance, there are two main types: event-based and time-based PM tasks (Einstein & McDaniel, 1990). *Event-based PM tasks* have to be performed afer a specific event took place (e.g. call someone when you receive a text message with the phone number) whereas *time-based PM tasks* need to be done at a particular moment in time (e.g. make the phone call at 5 pm). Also, importantly, the planned PM action has to be done while being in another ongoing task, therefore an interruption occurs from the current task to redirect their attention to the PM action. In event-based tasks, for example, a PM cue acting as an external event, triggers when to do the PM action. In *activity-based PM* tasks (Einstein, McDaniel, Marsh, & West, 2007) when a certain ongoing activity resumes, then the PM action should be performed (e.g. make a phone call after you finish a meeting).

Prospective memory has also been shown to tap on retrospective memory (Mattli, Schnitzspahn, Studerus-Germann, Brehmer, & Zöllig, 2014). Also, *executive resources* are important cognitive factors that might impact PM performance (see Mahy, Moses, & Kliegel, 2014a, for a review). Furthermore, recent studies have pointed to the fact that EFT might impact PM performance (Szpunar, 2010). Also, Neroni and collaborators (2014) have shown that the mental representation of the exact steps required for the PM action improves performance, compared to only better encoding of the PM task instructions (through the repetition of those instructions). Therefore, mental simulation seems to bring an added benefit to PM performance, besides only better MP intention encoding.

Prospective memory and negative affect

Regarding other potential factors that might modulate prospective memory functioning, one candidate is anxiety (see Kliegel & Jäger, 2006 for a review). In the scientific literature, it is well known that high levels of anxiety symptoms can impact WM resources (Eysenck, Derakshan, Santos, & Calvo, 2007). According to the *Attentional Control Theory* (Eysenck et al., 2007), the mechanism that explains this detrimental effect concerns the negative effect that anxiety thoughts have on the central executive component of WM (Owens, Stevenson, Hadwin, & Norgate, 2012). As WM is a key factor in PM performance especially when the cognitive WM load is high (Fronda, Monti, Sozzi, Corbo, & Balconi, 2020), then it is expected that anxiety will have a detrimental influence on PM performance. Two findings with preschool (Cheie, Miclea, & Visu-Petra, 2014) and school age children (Cheie, MacLeod, Miclea, & Visu-Petra, 2017) confirmed this hypothesis. The first study showed that high levels of trait anxiety lowered event-based PM performance in the younger age group of preschoolers (in 3-5 year olds as compared to 5-7 year olds). Also, in the second study, school age children had poorer event based PM performance when WM resources were depleted by either additional cognitive demands or high anxiety symptoms. In an adult sample of students (Arnold, Bayen, & Böhm, 2015), the prospective but not the retrospective component of an event-based PM task was negatively related with state anxiety. This relation did not hold true in the case of trait anxiety or depressive symptoms.

Autobiographical memory

Autobiographical memory is a complex memory system that develops across childhood and adolescence and integrates self-related knowledge to construct a personal history of an individual (Fivush, 2011). Therefore, autobiographical memory integrates short-term and long-term goals in order to define our identity and role in the world (Conway, Singer, & Tagini, 2004). Also, autobiographical memory includes events recalled from a person's life depicting experiences encoded in both *episodic* (personal memories of individuals or events that an individual recalls from a specific moment in time and place) and *semantic* (general information about the world) memory (Levine, Svoboda, Hay, Winocur, & Moscovitch, 2002). Although autobiographical memory has been intensively studied across the adulthood (Wolf & Zimprich,

2015), less research has focused on the development of this memory system in childhood and adolescence (but see Gott & Lah, 2014; Coughlin et al., 2014; Wang, Capous, Koh, & Hou, 2014).

Transition Theory

Life stories or life narratives help form the identity of an individual through integrating autobiographical memory with a personal account of self. Furthermore, everyday life can bring unexpected occurrences and changes into our usual routine and habits. Autobiographical memories are influenced by landmark important events that are often linked to life time periods (Conway & Pleydell-Pearce, 2000). When people employ historical events in order to organize their life course, then we can say that a living in history effect is present (LiH, Brown et al., 2009). How strong this LiH effect is depends not so much on the importance of a historical events but on how much it affected an individual's fabric of everyday life (Brown et al., 2009). Usually these transitional events are rather dramatic (e.g. natural calamities, wars, terrorism) and impact an entire population collectively, leading to the formation of a living in history effect. One study for example (Brown et al., 2009) found that the war in Bosnia was mentioned by 24% of the participants in their personal recollections – which is a sign of the formation of historically defined periods (delimitation before and after this transitional event – the civil war).

Cultural life script theory

Sometimes, our life course is marked by normative events that are expected to occur in a certain culture. For example, we might go to school, finish college, get married, have children, experience an illness, retire from our professional life, and so on. These important events mark certain normative transitions that the expectation of a certain socio-cultural context incurs in our mindset and set of values. Such script-like events play a key role in how autobiographical memory is organized and usually follow a certain chronological order and have a general positive valence (Bohn, 2010). Evidence for the presence of such cultural life script events, generally consisting of positive events, has been found in several studies from different cultures (Berntsen & Rubin, 2004; Bohn & Habermas, 2016; Habermas, 2007).

Connecting the past to the future: individual differences in anxiety and depressive symptoms

The ability to think and plan for the future is highly adaptive and allows us to act in the anticipation of our goals (Hanson, Atance, & Paluck, 2014). *Episodic future thinking* relies on episodic memory (Schacter & Addis, 2007) and on working memory (Hill & Emery, 2013) in order to construct future personal events..

Episodic future thinking and prospective memory (PM) represent two types of future oriented behaviors that have important implications in daily life. In recent years, a link between them was reported, in adult age (Altgassen et al., 2015; Neroni, Gamboz, & Brandimonte, 2014; Terrett et al., 2016), as well as in children (Kretschmer-Trendowicz, Ellis, & Altgassen, 2016; Nigro, Brandimonte, Cicogna, & Cosenza, 2014; Terrett et al., 2019). Nigro and collaborators (2014) gave 4- to 7 year olds, one task measuring episodic future thinking and a prospective memory task as well as some retrospective memory measures. They found that episodic future thinking as well as children's age predicted prospective memory in 7 year olds, after controlling for the contribution brought by retrospective memory. This suggests that in a younger age group, these two abilities (prospective memory and episodic future thinking) are not yet intertwined.

While it has been shown that negative transient or more stable emotional states such as those characterizing state/trait anxiety and depression negatively impact retrospective and prospective memory in both children and adults (see Cheie, MacLeod, Miclea, & Visu-Petra, 2017; Cheie, Miclea, & Visu-Petra, 2014; Opris, Cheie, Trifan, & Visu-Petra, 2018 – for developmental evidence), less research has yet been dedicated to exploring the link between EFT and internalizing problems. Given the abovementioned associations between EFT and retrospective/prospective memory, plus its reliance on executive functions for generating possible future scenarios, it is plausible that negative current/anticipated/trait emotions would have a detrimental role on children's EFT ability.

The relationship between episodic foresight and affective state

In a recent study on future thinking event construction in terms of emotional valence, the authors investigated the characteristics of imagining future desirable versus undesirable events

in adults (de Vito, Neroni, Gamboz, Della Sala, & Brandimonte, 2015). They found that adults imagined future desirable events with more internal details (episodic information) compared with the construction of undesirable events. Also, desirable events construction was characterized by a better clarity of sensorial and spatial temporal context. Surprisingly, trait anxiety was shown to increase, rather than decrease the level of internal details in the construction of both desirable and undesirable events.

CAR-FA-X model

The seminal *CAR-FA-X* model (Williams et al., 2007) could potentially offer a mechanistic view of how overgeneral memory appears: self or situational representations *capture* attentional resources and detract from the retrieval of specific events, with *ruminative* thoughts leading to a stronger focus on such distracting representations (CaR – Capture and Rumination). Moreover, adopting *functional avoidance* (FA – Functional Avoidance) as a strategy that detracts attention from negative personal thoughts, could lead to a lower access of specific information. This in turn can be associated with *executive functioning* deficits and a constrained retrieval of specific and detailed memories (X – impaired executive control). To date, research that investigates how the CAR-FA-X model can be translated into examining EFT deficits is still scarce, with most research having focused on autobiographical memory impairments. Reduced episodic future thinking in terms of impairments in simulating specific or detailed future events might also be associated with an impaired problem solving ability (Brown, MacLeod, Tata, & Goddard, 2002) and worse prospective memory performance (Terrett et al., 2019).

With regards to the relation between anxiety and EFT, until now, less research is available (but see de Vito et al., 2015; Wu et al., 2015). In one recent study (Bahri & Bahri, 2018) with adolescents with internalizing problems, results indicated that they displayed lower EFT performance (in terms of specificity and amount of details) and impaired working memory as compared to their healthy counterparts.

Conclusions and implications

To conclude, the recent literature reviewed in this chapter pinpoints to the importance of studying the development of episodic foresight, with a focus on elucidating the dimensions that encompass this very complex ability under the umbrella term of *prospection*. Untill now,

several approaches and explanatory models have attempted to propose components and underlying processes of this episodic future thinking ability (e.g. see Szpunar & Radvansky, 2016 for a cognitive approach).

Thesis overview

The main aim of this thesis was to clarify the developmental prerequisites and correlates of autobiographical memory and episodic foresight. Across the four studies included in this thesis, we based our predictions on the CAR-FA-X model, by looking at how internalizing symptoms (anxiety, depression), executive functioning and retrospective memory can be underlying factors of foresight systems (episodic future thinking and prospective memory). In this light, we looked at two broad directions: (1) either internalizing symptoms or executive functioning might *separately* impair prospection directly or through retrospective memory deficits, or (2) an *interaction* between internalizing symptoms and executive functioning deficits could lead to lower prospective ability either directly or through impaired retrospective memory.

CHAPTER 2

Internalising symptoms and verbal working memory in school-age children: A processing efficiency analysis[2]

Introduction

The interaction between working memory (WM) functioning and emotional processes has been a long-standing research direction, with a growing body of evidence indicating that, across the lifespan, internalizing symptoms predict poorer memory performance (Moran, 2016). The detrimental role of internalizing symptoms is mostly evident in verbal WM tasks, as it is thought that symptomatology-specific worrisome thoughts not only affect the central executive component of WM, but also interfere with the functioning of its phonological component (Schmeichel & Tang, 2015). However, little is known about (1) the differential contributions of the internalizing symptoms (i.e. state, trait anxiety, depressive symptoms) to memory functioning in children, and (2) how these different symptoms are related to specific WM performance indicators (i.e., short-term recall, WM updating, various response time measures).

Children's ability to store and manipulate information gradually expands from their preschool years to adolescence (Alloway, Gathercole, & Pickering, 2006).While short-term memory (STM) involves the temporary storage of information, WM has been defined as the system in charge with storing and manipulating information needed to solve a specific task (Miyake & Shah, 1999). In an attempt to distinguish various executive processes involved in WM recall, Cowan and collaborators (2003) proposed a ***microanalysis of memory processes***, separating the distinct response time segments of the verbal recall output into time taken to (1) prepare an answer (preparatory intervals), (2) verbalize each word (word durations), and (3) pause in-between recalled words (interword pauses). While *preparatory intervals* involve processes such as list rehearsal, memory search processes, and motor programming of the verbal response, *interword pauses* are mainly characterized by memory search processes and retrieval operations (Cowan et al., 2003). These silent intervals represent potential indicators of executive processes involved during memory recall and are sensitive to increases in task demands.

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[2] This study has been published as: Opris, A.M., Cheie, L., Trifan, C., & Visu-Petra, L. (2018) Internalising symptoms and verbal working memory in school-age children: A processing efficiency analysis. *International Journal of Psychology*. https://doi.org/10.1002/ijop.12537

Internalizing symptoms are characterized by self-directed internal distress and over-controlled behaviors (Tandon, Cardeli, & Luby, 2009) While state anxiety refers to the temporary anxiety experienced during certain situations, trait anxiety denotes a general predisposition to experience anxiety across a various range of situations. The Attentional Control Theory (Eysenck et al., 2007) posits that anxiety has adverse effects on processing efficiency (resources invested in performance), by requiring compensating strategies in the presence of worrisome thoughts. Performance effectiveness (response accuracy) can also be impaired in the context of higher executive demands (Eysenck et al., 2007).

The role of *trait anxiety* in children's STM and WM has been documented by previous studies (Visu-Petra, Cheie, Benga, & Packiam Alloway, 2011; Visu-Petra, Miclea, Cheie, & Benga, 2009). In these studies, children with higher trait anxiety took more time to prepare an answer (preparatory intervals) and paused longer in-between their recalled words (interword pauses) on the verbal STM tasks (Visu-Petra et al., 2009), while both performance efficiency and accuracy were impaired on the more executive demanding WM tasks (Visu-Petra et al., 2011).

With regards to *state anxiety*, a study investigating its role in children's verbal STM/WM, as well as on visuospatial STM (Hadwin, Brogan, & Stevenson, 2005) found that 9-10 year-olds with high state anxiety displayed longer overall response times on a verbal WM task. Most findings suggest that state anxiety impacts children's WM performance primarily in evaluative situations (Visu-Petra, Miclea, & Visu-Petra, 2013), and that a temporary increase in state anxiety levels due to an experimental manipulation does not further contribute to trait anxiety's capacity to independently predict children's poor WM (Ng & Lee, 2015).

Considerably less is known about the effects of *depressive symptoms* on WM performance. Depressed individuals display intrusive ruminative thoughts which can affect their ability to concentrate attentional resources to the cognitive task at hand (Levens, Muhtadie, & Gotlib, 2009). This effect is mostly evident when the memory task is demanding and requires elaborate information processing, with more structured information imposing less cognitive demands (Baddeley, 2013).

Current study

This study set out to extend the limited existing literature regarding typical variation in the relation between individual differences in anxiety and depression and STM / WM in school-age children. To our knowledge, this is the first study in which the relation between different internalizing symptoms and verbal STM/WM performance is assessed at detailed

level of efficiency (microanalysis of response time) and accuracy in a unitary design. We expected: (1) a stronger relation between internalizing symptoms and the more executively demanding WM task, as compared to the simple storage demanding STM tasks. Based on the previous reported effects in the literature of trait anxiety, we expected: (2) a stronger relation between anxiety symptoms and children's performance efficiency, compared to their performance accuracy on the STM tasks. Also, starting from results showing differential contributions of state versus trait anxiety on memory functioning (e.g., Ng & Lee, 2015), we expected: (3) a stronger association between memory performance efficiency and accuracy and trait anxiety, as opposed to state anxiety. Moreover, based on the results by Owens and collaborators (2012), we expected: (4) higher depressive symptoms to be negatively associated with performance on the WM task (accuracy and efficiency). Finally: (5) internalizing symptoms were expected to display a stronger association with the "silent" – more executive demanding – intervals (preparatory intervals, interword pauses), as compared to the less executive soliciting span efficiency indicator, word durations.

Method

Participants

A total of 130 school-age children from two public schools in north-west of Romania participated in this study. Three children could not be evaluated with the memory measures and two failed to complete the questionnaires. Children in the final sample (N = 125, M = 11.44 years, SD = 0.54; 75 girls) came from households that varied as a function of parental education (58.7% of mothers had at least an undergraduate degree, 41.3% graduated from high-school).

Measures

Internalizing symptoms

The *State-Trait Anxiety Inventory for Children* (STAI-C; Spielberger, 1973) contains two scales with 40 items that tap into both state and trait anxiety. Scores corresponding to each scale can vary from 20 to 60. The internal consistency in our sample was very good, for both state anxiety (measured before the individual testing session), α-Cronbach = .88 (N = 121), and the trait anxiety scale, α-Cronbach = .87 (N = 118).

The *Child Depression Inventory* (CDI, Kovacs, 1992) was used to measure individual differences in depression. The short version includes 10 items measuring (cognitive, behavioral, emotional) depressive symptoms in children. The highest score is 20. In our sample, the questionnaire presented a very good internal consistency, α-Cronbach = .84 (N = 123).

Memory span measures

We used several tasks from the standardized battery AWMA (Alloway, 2007; Visu-Petra et al., 2011– Romanian adaptation) to assess verbal STM and WM in children. During task unfolding, six trials are given at each list length. If recall is correct on four out of the six trials for each list length, the length of the sequence is increased by 1 item. Each child receives a 1 point score for correctly recalling the entire list length. If the child fails to reproduce three sequences in a list length, testing is stopped.

Short-term memory. During the *Word Span*, the child listens to a sequence of highly familiar one-syllable words (e.g. "apple, bull, frog") and has to recall each sequence in the correct order. On the *Nonword span* task children are asked to recall series of made-up words.

Working memory: During *Listening Span*, the child is presented with increasingly longer series of short sentences (e.g. "*The grass is blue"*) and must judge if each sentence is *true* or *false* by providing a *yes*/*no* answer to each sentence. Subsequently, children are required to recall the last word from each sentence. Six trials were included for each list length.

Aggregate span scores. A sensitive measure of performance accuracy was calculated, by considering children's response accuracy across list lengths for each memory measure, following the procedure described by Cowan and collaborators (2003). Hence, for example, if a child correctly recalled 6 trials of two-word lists, and 2 three-word lists, an aggregate span of 2 + 2*0.167 = 2.34 was computed.

Microanalysis of response times. The speed of children's verbal response segments represented an indicator of performance efficiency. Following Cowan et al.'s methodology (2003), we analyzed the oscillographic display of the verbal response using a speech waveform editor (Cool Edit Pro, v.2.1). We measured the duration taken to prepare the answer (preparatory intervals), the pauses in-between words (interword pauses), and the actual time taken to reproduce each word (word durations). Response timing measurements were analyzed only for correct responses, thus reducing the response timing analysis to list length 2 (LL2) and list length 3 (LL3). Afterwards, an average of children's means for LL2 and LL3 was calculated for each response time segment in order to investigate the associations between the variables of interest.

Procedure

Children for whom we obtained a written parental consent initially completed the trait anxiety and depression scales. They were then individually tested, during a single session lasting approximately 25-30 minutes. First, each child completed the state anxiety subscale (STAI-C), then the Word and Nonword span (STM tasks), followed by the Listening span

(WM task). Finally, the state anxiety subscale (STAI-C) was re-administered. Participants' verbal responses on all tasks were audiotaped.

Results

As the distribution of questionnaire scores were skewed, we employed a natural logarithmic transformation for normalizing the distribution on all questionnaire scores

We first tested for potential *gender* effects on performance accuracy, and a significant difference on Word span was found, $F(1, 121) = 6.10$, $p = .01$, indicating that girls ($M = 3.31$, $SD = 0.79$) had a better performance than boys ($M = 2.90$, $SD = .97$). Looking at performance efficiency, girls took less time preparing their recall ($M = 1423.13$, $SD = 613.61$) compared to boys on the Listening span task ($M = 1686.83$, $SD = 639.37$), $F(1, 93) = 4.03$, $p = .047$. All regression models were bootstrapped.

Performance accuracy

For Word span accuracy, gender was a significant negative predictor, $\beta = –.23$, $p = .016$, indicating that compared to girls, boys had lower span performances, with .41 accuracy points on average (95% Bca CI [–.74,–.08]). State anxiety was a significant negative predictor for children's span scores, $\beta = –.21$, $p = .023$ ($sr^2 = .03$) with a one percent increase in state anxiety leading to a decrease in children's performance by 0.009 units representing accuracy points (95% Bca CI [–1.62,–.13]). Trait anxiety and depression were nonsignificant predictors for children's word spans. When adding depression in the last step, state anxiety was no longer significant ($p = .066$).

For Listening span, trait anxiety brought a significant contribution to the aggregate span variance, $\beta = –.25$, $p < .001$ ($sr^2 = .05$), indicating that a one percent increase in trait anxiety predicted a .007 accuracy decrease in children's performance (95% Bca CI [–1.25,–.27]). When adding depression as a predictor to the model in the last step, trait anxiety remained a significant predictor to listening span accuracy ($p = .006$).

Short-term memory efficiency

Variance in Word span performance efficiency (preparatory intervals) was not explained by any of our predictors. On Word span interword pauses, trait or state anxiety did not bring a significant contribution to the model. Depression represented a significant positive predictor, $\beta = .20$, $p = .019$ ($sr^2 = .03$) indicating that a one percent increase in depression scores predicted an increase of .052 milliseconds (95% Bca CI [.87, 9.147]). Looking at word durations, trait anxiety represented a significant predictor when added to the regression, $\beta = .24$, $p = .033$ ($sr^2 = .05$) indicating that a one percent increase in trait anxiety predicted an

increase of 0.63 milliseconds (95% Bca CI [7.65. 118.22]). When adding depression as a predictor in the last step, trait anxiety was no longer significant (p =.08).

State anxiety represented a positive predictor for children's Nonword span preparatory intervals, β = .27, p = .047 (sr^2 = .06) indicating that a one percent increase in state anxiety predicted an increase of 1.92 milliseconds (95% Bca CI [16.83, 371.71]). When depression was added to this model, state anxiety did not remain a significant predictor (p >.06).Trait anxiety and depression scores did not bring a significant contribution to the model. State anxiety was also a positive marginal significant predictor for children's Nonword span interword pauses, β = .22, p = .057 (sr^2 = .04), indicating that an increase of one percent in state anxiety predicted an increase in children's interword pauses of 1.04 milliseconds (95% Bca CI [1.14, 193.98]). When depression scores were added to the model, the contribution of state anxiety was no longer significant (p = .072). On word durations, trait anxiety proved to be the only significant predictor, β = .20, p = .049 (sr^2 = .03), indicating that an increase of one percent in trait anxiety predicted an increase in children's word durations of .48 milliseconds (95% Bca CI [2.65, 93.41]). When adding depression in the next step, trait anxiety remained significant (p = .044).

Working memory efficiency

For preparatory intervals on Listening span, gender represented a significant predictor, β =.20, p = .050, indicating that boys took longer to prepare their responses compared to girls (b = 263.69, 95% Bca CI [.87, 536.42]). Additionally, state anxiety predicted children's listening span preparatory intervals, β = .25, p = .053 (sr^2 = .05), indicating that a one percent increase in state anxiety, increased the length of preparatory intervals by 7.93 milliseconds 95% Bca CI [51.60, 1484.06]).When adding depression in the last step, state anxiety did not remain significant (p = .151). Trait anxiety and depression were nonsignificant predictors.

For interword pauses on Listening span, trait anxiety represented a marginally significant positive predictor, β = .26, p = .054 (sr^2 = .06), indicating that a one percent increase in trait anxiety was associated with an increase of 4.61 milliseconds in interword pauses (Bca CI [52.70, 964.02]). When adding depression, trait anxiety remained marginally significant (p = .052).

Discussions

Our results revealed that trait anxiety is a robust negative predictor of children's performance especially when the task imposes higher demands on the central executive processes (i.e. WM task). In such cases, trait anxiety was found to impair both children's performance accuracy and efficiency performances (Visu-Petra et al., 2011). Nevertheless, trait anxiety's negative contribution was also evident in some STM efficiency indicators (e.g., word duration). Thus, our results reveal trait anxiety as a robust predictor of children's poorer WM performance, expanding at the level of WM span accuracy; they also suggest that children's higher state anxiety can be considered a specific predictor of school-age children's STM accuracy and efficiency. Nevertheless, when children's depression scores were added in the model, many anxiety-related effects were nonsignificant, suggesting that at this age, anxiety and depression-related symptoms are not strongly differentiated (Garber & Weersing, 2010), and their shared negative affectivity might be responsible for previously found anxiety-specific STM/WM deficits. Depression scores were only related to word span interword pauses, suggesting that children's trait depression might not play a significant role in explaining children's WM variations over and above the influence of state/trait anxiety; WM impairments could be more prevalent in clinically depressed groups. Importantly, however, all internalizing symptoms predicted children's poorer memory search efficiency during the "silent" intervals (i.e., interword pauses), suggesting that the detrimental role of these symptoms is generally evident at the level of this more executive demanding segment involved in memory recall. Thus, the study highlights both the common and the differential contributions of state, trait anxiety and depressive symptoms to STM/WM in children, emphasizing the need to measure both accuracy and efficiency to assess the role that such symptoms play in children's performance.

The present findings can inform future intervention and prevention programs designed to improve WM to reduce primarily anxious symptoms (see Hadwin & Richards, 2016) with implications for better academic performance (Owens et al., 2012) and adjustment in children. Children who exhibit higher levels of anxiety and trait depression and lower updating capacity could benefit most from these interventions (Owens et al., 2012). The current findings pinpoint to the specific circumstances under which internalizing symptoms are negatively related with storage and updating efficiency, offering a unique perspective regarding associations with these abilities in the school-age years.

CHAPTER 3

Relating the development of episodic future thinking to cognitive and affective individual differences and to motivational relevance in preschoolers [3]

Introduction

Being effective in setting goals and generating feasible scenarios relies on a capacity to envision a plan for the future, enabling us to be proactive in our goals pursuit (Hanson et al., 2014). *Episodic future thinking* (EFT, also referred to as *episodic foresight*) is defined as the ability to imagine events that might happen in our personal future (Schacter et al., 2017).

Children's future thinking emerges between 3 and 5 years of age (Russell, Alexis, & Clayton, 2010) and several methodological approaches have been developed to study episodic foresight early on (see Hudson, Mayhew, & Prabhakar, 2011, for a review). A seminal method to measure EFT is the *item choice paradigm* (Suddendorf, Nielsen, & Von Gehlen, 2011), in which a preparatory action is required for future problem resolution.

Predictors of future oriented behaviors

When looking at various aspects of children's future-oriented behavior such as EFT or PM, *developmental considerations* are essential. Studies of children's future-oriented behaviors reveal substantial progress during the preschool years (Atance & Jackson, 2009), with a constant increase in foresight ability being reported until the age of 8, and a subsequent steady development into adolescence (Ferretti et al., 2018).

Among the developmental variables which might be responsible for the age-related progress in EFT, *verbal skills* are an ideal candidate, as the ability to inwardly verbalize the steps of a plan is essential to episodic foresight. Measures of receptive vocabulary administered to young preschoolers (3-4 years) were not significantly related to EFT abilities (Cuevas, Rajan, Morasch, & Bell, 2015), but they were well associated with older (4-6 year old) children's EFT performance (Naito & Suzuki, 2011). Besides verbal skills, progress in *episodic memory* skills is also integral to EFT development, aspect which although clearly documented in adults (Schacter & Madore, 2016), was not confirmed in a preliminary investigation with young preschoolers (Cuevas et al., 2015).

Increases in both *phonological short-term memory* (STM) and *verbal working memory* (WM) capacity correlate with measures of (mainly verbal) EFT during elementary

[3] This chapter was submitted to *Journal of Cognition and Development*: Opris, Cheie & Visu-Petra (2020). Relating the development of episodic future thinking to cognitive and affective individual differences and to motivational relevance in preschoolers.

school (Ferretti et al., 2018). The authors contend that the ability to extract episodic memories from long-term declarative memory is essential for EFT, and the phonological WM could keep these memories active (via subvocal rehearsal) before a potential new episode can be mentally generated.

One contextual variable that is highly relevant in the case of episodic foresight is the *emotional/motivational relevance* of the situation, especially when the EFT task implies future problem solving relevant to the child's goals. This motivational aspect of the task has not yet been extensively investigated, with few notable exceptions such as the study of Mahy, Grass, Wagner and Kliegel (2014) who expanded the Pretzel task developed by Atance and Meltzoff (2006) and introduced the concept of "cool" versus "hot" episodic foresight tasks for children. They define "hot" EFT tasks as those involving self-projection into future scenarios that have a motivational component (anticipating whether the next day one would prefer pretzels over water, given that they are currently very thirsty), while "cool" episodic foresight tasks only involve abstract reasoning based on semantic scripts without an obvious emotional or motivational component. Interestingly, performance on the original Pretzel task did not show any age-related improvement between 3 and 5 years (Atance & Meltzoff, 2006). In this context of future self-projection, individual differences in dispositional variables such as *trait anxiety* or anxiety symptoms could be involved in modulating EFT performance. A seminal theoretical account explaining the detrimental effects of anxiety on cognitive performance in general is the Attentional Control Theory (ACT, Eysenck, Derakshan, Santos, & Calvo, 2007), according to which anxiety disrupts attentional control by reducing the cognitive resources available to the task at hand, due to worrisome thoughts interference. This EFT impairment could be especially relevant in emotionally or motivationally relevant situations. High-anxious individuals produced less relevant problem solving steps in order to reach a given result and solve a personally worrisome problem (Hallford, Noory, & Mellor, 2018).

Current study

Our first aim was to investigate *age related differences* in EFT performance during a developmentally sensitive window (3-6 years). Based on the results of Atance and Sommerville (2014) we investigated whether these potential age differences in EFT are predicted by developmental growth in the retrospective memory of the problematic situation. Additionally, we assessed whether the motivational/emotional valence of the task can influence EFT development.

A secondary aim was to explore if individual differences in *anxiety* (and especially social anxiety symptoms as the negative EFT condition presented embarrassing/negative social exposure situations) played a role in children's EFT and whether this relation was modulated by the emotional *valence* of the task. Finally, we aimed to verify the documented role of *verbal* abilities (comprehension of instructions, verbal fluency, verbal short term and working memory) to foresight ability in the context of the new motivationally relevant tasks.

Method

Procedure

The study procedure entailed parents first signing an informed consent, and completing a sociodemographic questionnaire, then responding to two questionnaires measuring their child's internalizing symptoms and everyday prospective/retrospective memory errors, respectively. Afterwards, children were tested in two individual sessions, with the first session lasting for approximately 1 hour (Word span task, 6 item choice problems) and the second session for 30 minutes (Comprehension of instructions, Verbal fluency and 3 item choice problems).

Participants

We evaluated 92 preschool children, aged between 3 and 6 years (42 girls, M = 4.03 years, SD = .92), from two kindergartens in the North-western region of Romania. All parents offered written informed consent for their children to take part in the study, and each child agreed to participate by offering their verbal assent.

Questionnaire measures (parental reports):

*Trait anxiety***.** The *Spence Preschool Anxiety Scale* (Spence, Rapee, McDonald, & Ingram, 2001; see Benga, Tincas, & Visu-Petra, 2010 for the Romanian version) is a questionnaire designed to measure symptoms of anxiety in preschoolers. Using a five point Likert scale (ranging from 0 – *not true at all* to 4 – *very often true*), parents are asked to rate their children's anxiety symptoms. Internal consistency of the overall scale is alpha Cronbach = .87 (Benga et al., 2010).

*Prospective and retrospective memory***.** *The brief Prospective Retrospective Memory Questionnaire for Children* (PRMQC) was adapted from the version created for children by Talbot and Kerns (2014) based on the original PRMQ questionnaire (Smith, Della Sala, Logie, & Maylor, 2000) designed to measure how often respondents face everyday problems in their prospective and retrospective memory. It contains 16 questions about prospective and

retrospective memory errors. Parents rated how often their child experienced each type of memory error, ranging from (1) *never* to (5) *very often*, with a minimum score of 16 and a maximum score of 80 indicating a high frequency of everyday prospective and retrospective memory problems. The reliability of the PRMQ-C scale is very good (Talbot & Kerns, 2014) with an alpha Cronbach of .93.

Behavioral measures (children)

Verbal short term memory (STM) was assessed with the *Word span* from the standardized AWMA battery (Alloway, 2007; see Visu-Petra, Cheie, Benga, & Packiam Alloway, 2011 for the Romanian adaptation), consisting of a series of one-syllable words that the child had to remember and repeat exactly as presented. During the task, three trials are given at each list length. If recall is correct on two out of the three trials for each list length, the length of the sequence is increased by 1 item. Each child receives a 1 point score for correctly recalling the entire list length. If the child fails to recall two sequences in a list length, testing is interrupted. Based on the procedure by Cowan and collaborators (2003) an aggregate span was calculated.

Comprehension of instructions (NEPSY; Korkman, Kirk, & Kemp, 1998; see Visu-Petra, 2008 for the Romanian adaptation), is a task of receptive vocabulary in which children were shown an image depicting several rabbits differing in three dimensions: *color* (blue or yellow), *size* (small, big) and *emotion* (happy, sad) and asked to indicate one rabbit that had certain/multiple characteristics (e.g. "*Show me a sad yellow little rabbit*"). Children received 1 point for each correct response from a total of 13 questions. Therefore, children's minimum score was 0 and the maximum score was 13.

Verbal fluency (Korkman, Kirk, & Kemp, 1998; see Visu-Petra, 2008 for the Romanian adaptation), required children to name as many animals they could think of, then name things they can eat/drink in a limited amount of time (1 minute). Children received a total score summing the number of correct responses they generated for both categories (food, animals) in the limited amount of time of 1 minute/ category.

Episodic future thinking measures

To investigate whether children's EFT varied as a function of the task's motivational relevance, including either hot (positive and negative valence) or cold (neutral valence) EFT, we used 9 problem-solving EFT scenarios that differed with regards to their emotional valence: neutral (i.e., Smiley face, Box, Toy problems), motivational/positive – involving obtaining something for personal use (i.e., Juice, Bubbles, Target problems) or aversive – involving negative personal exposure (i.e., Ad, Pronunciation, Album problems). The

participants were presented with the problem-solving EFT scenarios in a counterbalanced order based on the emotional valence (i.e., neutral, positive, aversive). All tasks had the same procedure: presenting the child with a problematic situation in Room 1 and then moving to Room 2 where, for 5 minutes, children were engaged in distracter activities (games). Afterwards, children were told that they had to return to the previous room and were presented with four possible objects (one correct, one optional, the other two incorrect) and asked to choose which object they would like to bring with them to Room 1 without being reminded of the previously presented problem.

After choosing the object (*Item choice score:* 1 point awarded for choice of the correct or optional object, 0 points for one of the two distracters), children were asked why they chose that particular object (*Explanation Question*) and if their explanation did not refer to the previously presented problem, they were asked whether they remembered what that problem was (*Memory question,* 1 point awarded for correct recall). At the end, we asked all children, with the problem acting as a visual cue and all objects present, what they would choose to solve that specific problem (*Knowledge question*: 1 point awarded for correct choice showing that they had the ability to solve the problem in the present). For each EFT task, a sum of children's scores on the choice and on memory questions, respectively was calculated. Consequently, children's points on the item choice/memory questions were added across the three conditions for each valence (positive, negative, neutral).

Neutral EFT problems. There were three "cool" EFT tasks with no motivational relevance for the child, only describing problem solving scenarios requiring abstract reasoning to solve a current problem. Below we present one example.

Smiley Face (Atance & Sommerville, 2014). Children were shown a cardboard smiley face and were told that the experimenter wanted to show the child the smiley face but that, unfortunately, one eye had fallen off. After 5 minutes playing unrelated games in Room 2, children were asked the Item choice Question (see Atance & Sommerville, 2014) inquiring what object they wanted to choose in order to take with them to Room 1. Children were shown the following four objects on a plate: glue (correct option), adhesive tape (second correct option), scissors, pen. The final knowledge question was: "*Which one of these four objects can be used to fix the cardboard*?".

Positive EFT problems. Three "hot" EFT tasks with a motivational relevance for the child were employed, involving a certain gain for the child. Below we present one example.

Juice (Atance & Sommerville, 2014). Children were presented with a plastic cup stuck to a tray. The juice was poured in the cup, and children were told that, unfortunately, they could not drink the juice because the cup was stuck to the tray (*"Oh no, the cup is stuck to the*

tray, so you can't drink the juice!"). The objects from which children could choose in order to solve the task were: a sharpener, a ruler (second correct option), sewing thread, a straw (correct option). The final knowledge question was: "*Which one of these four objects can be used to drink the juice?*"

Negative EFT problems. Three "hot" EFT tasks with an aversive scenario for the child were employed, in which children had to prepare for a certain anticipated uncomfortable situation. Below we present one example.

Ad task.

Children had to pose for an ad using a cartoon mask (depicting Elsa from Frozen for boys and Spiderman for girls). They were told that they had to put on the mask and position their hands alongside their body in order to take a photo for a cartoon ad (about Elsa or Spiderman). As the mask lacked the elastic band, children could not put on the mask without it falling off. Children were told: "*Oh, we can't make the ad because the mask falls off*". The choice objects were: elastic (correct), fur wire (second correct option), coloured pen, post-its. The final knowledge question was: *"Which one of these four objects can be used to make the ad?"*

Results

Preliminary analyses

First, we tested for *gender* differences for all the variables of interest by conducting independent samples *t* tests. Results showed that girls displayed better EFT choice accuracy (M = 6.29, SD = 1.45) compared to boys (M = 5.59, SD = 1.67), $t(90) = -2.14$, $p = .035$. ***Main analyses***

First, with all covariates in the linear mixed model, results confirmed the main effect of *motivational valence*, $F(2, 83.86) = 7.50$, $p = .001$, reflecting a significant difference in children's performance in terms of the condition (positive, neutral, negative). Compared to the negative valence condition, children performed better in both the neutral (b = 1.11, SE = .53, $t(83.44) = 2.06$, $p = .04$, 95% CI [.04, 2.18]) and positive valence condition (b = 2.11, SE = .54, $t(83.85) = 3.86$, $p < .001$, 95% CI [1.02, 3.20])

Second, results showed a main effect of *age* on EFT choice performance, $F(1, 84.39) = 9.93$, $p = .002$, reflecting better EFT performance for older children. Thus, for every 1 month increase in age, children's performance increased by 3% (b = .03, SE = .007, $t(95.91) = 4.22$, $p < .001$, 95% CI [.01, .04]). The main effect of *social anxiety* also proved significant, $F(1, 85.66) = 6.31$, $p = .01$, indicating that a 1 point increase in social anxiety score was associated with 7% decrease in EFT choice accuracy (b = -.07, SE = .02, $t(79.95) = -3.61$, $p = .001$, 95% CI [-.12, -.03]). The effect of *EFT memory* was also significant, $F(1, 85.01) = 11.15$, $p = .001$,

indicating that a 1 point increase in children's memory score was associated with an increase of 7% in EFT choice accuracy (b = .07, SE = .02, t(85.01) = 3.34, p = .001, 95% CI [.03, .12]). The interaction between Valence x Age was significant, F(2, 84.09) = 5.12, p = .008. This significant interaction revealed that with a 1 month increase in age, children's performance improved by 3 % on the negative EFT as compared to the positive EFT condition (b = -.03, SE = .009, t(84.40) = -3.20, p = .002, 95% CI [-.04, -.01]).

The second tested interaction between Valence x Social anxiety also proved significant, F (2, 84.87) = 3.82, p = .02 (, indicating that as the social anxiety score increased by 1 point, children decreased their performance by 8% on the negative condition compared to the positive one (b = .08, SE = .03, t(86.31) = 2.72, p = .008, 95% CI [.02, .14]).

Discussions

In conclusion, findings from the present study reflect the contribution of age, memory, valence and anxiety to children's foresight ability, suggesting that EFT is a complex interplay of factors not limited to age and memory improvements (Ghetti & Coughlin, 2018). Our results confirm the fact that the ability to anticipate future situations relies on the development of memory, as EFT is already known to be based on autobiographical memory for constructing and preparing for future events/experiences (Prabhakar & Ghetti, 2019; Wang et al., 2014).

To our knowledge, there are no studies to date that investigated the link between foresight and anxiety using this behavioral item choice approach to measure EFT. We argue that our study extends and adds to the current literature, by showing that children as young as 3-6 year old, show an anxiety related impairment in their ability to choose prospectively for a future need, especially when the task has a negative emotional value. Children who are more prone to be affected by social evaluation could have been more sensitive to this negative future scenario in which they had to be exposed to several uncomfortable situations.

Taking all findings into account, the current study shed light on age-related improvements in future thinking capacity in the 3 to 6 developmental window, particularly on the relationship between memory and foresight, and the specific detrimental influence of anxiety symptoms. The present research brings several contributions to the current literature on foresight by showing that EFT is a complex ability in continuous development especially in the preschool years that taps on an array of cognitive and affective factors. Further research is needed to expand our knowledge regarding the complex mechanisms underlying EFT and their cognitive/affective substrates.

CHAPTER 4

Age-related increments in schoolchildren's prospective memory depend on the cognitive resources employed by the task [4]

Introduction

Prospective memory (PM) is an essential component of future-oriented cognition, representing the capacity to remember an intention and execute it at a specific future moment (Ellis & Kvavilashvili, 2000). Although researchers agree upon the paramount importance of PM abilities for children's optimal cognitive and everyday functioning (Mahy, Moses, & Kliegel, 2014; Terrett et al., 2019), relatively little is known about the factors underpinning variation in the success of schoolchildren's prospective remembering. Recent studies suggest that PM success and age-related improvements vary as a function of the PM task type and, implicitly, the specific cognitive resources demands employed by each of these tasks (e.g., Terrett et al., 2019; Zhao et al., 2019; Zuber, Mahy, & Kliegel, 2019).

Executive functioning and age-related changes in PM performance

According to the seminal multiprocess framework (McDaniel & Einstein, 2000), at various stages of solving a PM task (intention formation, retention, initiation and execution), a variety of more or less strategic processes are deployed. Such controlled processes are subsumed under the umbrella construct of executive functions (EFs), which enable goal directed behavior by relying on the interplay of working memory (WM), inhibitory control, shifting, planning or monitoring processes (Friedman & Miyake, 2017). Recent studies subscribe to the tripartite EF model and identify updating (manipulating information stored in WM), inhibition (refraining prepotent responses and resisting distraction) and shifting (switching between task/ mental sets) as the major independent yet interdependent executive processes contributing to PM performance (Zhao et al., 2019; Zuber et al., 2019).

The executive functioning approach to PM development (Mahy et al., 2014) proposes that age-related changes in various EFs (Best & Miller, 2010) represent the main mechanism catalyzing the documented PM progress from early childhood until late adolescence (Kretschmer-Trendowicz et al., 2016; Kretschmer, Voigt, Friedrich, Pfeiffer, & Kliegel,

[4] This chapter is submitted for publication: Cheie, Visu-Petra, Opris (2020). Age-related increments in schoolchildren's prospective memory depend on the cognitive resources employed by the task.

2014). Therefore, although up to date, no consistent picture emerges for the differential EF involvement in children's successful PM, there is some consensus regarding PM's reliance upon children's updating abilities across multiple types of tasks, followed by its reliance on inhibition, but yielding mixed results for the role of shifting (Zuber et al, 2019).

Across the school years, PM performance improves significantly (Kliegel, Mahy, Voigt, Henry, Rendell, & Aberle, 2013), yet this progress was found to be modulated by the type of PM task (e.g., event-, time-, activity-based tasks) and by the differential contributions in the EFs that such tasks require. As such, less evident age-related improvements have been found in PM tasks where processing the cue signaling the PM action is part of the ongoing activity that the participant is performing (i.e. *focal* tasks, Einstein & McDaniel, 2005). While some studies indicated age-related progression (Cejudo, Gómez-Ariza, & Bajo, 2019), others did not find substantial age related variation during early school years (Kliegel et al., 2013) on such tasks. However, when tasks require processing a PM cue that is not part of the ongoing activity (i.e. *nonfocal* tasks), PM improvements are consistently found when comparing children to adolescents and adults (Kretschmer-Trendowicz et al., 2016) or within the school-age period (e.g., Zuber et al., 2019). Similarly, most studies find substantial age-related improvement in *time-based* PM tasks from preschool to adolescence (Kerns, 2000; Mackinlay, Kliegel, & Mäntylä, 2009; Voigt et al., 2014).

Roles of episodic future thinking abilities

All PM tasks involve a prospective component (remembering that you have to do something) and a retrospective one (remembering when you have to perform the intended action and what the intended action is, Einstein & McDaniel, 1996). One of the mechanisms through which the encoding of the PM intention in memory can be strengthened is the mental simulation of the future situation when the PM action would be enacted, thus through the potential involvement of *episodic future thinking* (EFT) (Schacter et al., 2017). For younger populations, an EFT-PM positive association was evident in 7 year-olds, but not in younger children (Nigro et al., 2014).

Current study

The general goals of the present study were to (1) examine age-related PM improvement, as well as specific contributions of EFs (updating, inhibition, shifting), and episodic foresight specific abilities (EFT retrospective memory and EFT performance) in schoolchildren; and to (2) identify, for the first time, whether these contributions vary across different types of PM tasks (event-, time- and activity-based). To identify potential performance differences as a

function of specific cognitive resources deployed by task specificities, event- and time-based outputs from two of the most widely used computerized PM tasks were employed.

Method

Participants

A total of 86 primary school-age (6 to 10 year-olds) were evaluated for this study. Four children were excluded from the analyses: three due to technical errors when saving their PM outputs, and one child failed to remember the PM instructions at the end of the task. Hence, the final sample consisted in 82 children (44 girls, M = 8.20 years, SD = 1.37). All parents offered informed consent for their children to take part in the study, and each child agreed to participate by offering their verbal assent.

Materials

Prospective memory

Fishing Game (Yang, Chan, & Shum, 2011) was designed to allow the evaluation of schoolchildren's time-based, event-based and activity-based PM performance. In this computerized task, children are shown a boat with a cat and a fishpond. Their first instruction is to catch the fish in order to earn points (i.e. ongoing task) by positioning the mouse cursor over the fish they want to catch and clicking. In the *event-based* version, in addition to catching the fish, children are instructed to remember to stop fishing and turn to feed the cat (clicking on the cat; i.e., PM action) when a specific fish (a yellow fish with blue stripes; i.e. PM cue) appears among the others. The PM cue appeared three times, thus the PM score ranged from 0 to 3 points. In the *time-based* version of the task, children had to remember to feed the cat by clicking on it (PM action) when the clock depicted on the upper left part of the screen showed the exact passing of either one, two, or three minutes. Both PM versions also included an *activity-based* PM task. At the beginning of each of the two versions, children were instructed that the game would be over when a fishbone appeared on the screen, indicating that there were no more fish in the pond. Upon seeing it, they would have to click on the boat in order for the fisherman to return home and exit the game.

After ensuring children understood all task requirements, the experimenter introduced them to a five-minute distracter task (i.e. Nonword Span or Digit Span). After this five-minute period, children were asked to start the game, without being reminded of the PM instructions. After children completed the first PM task type, they were presented with the

instructions for the second PM task type and, after the five-minute distracter task, they were engaged in this PM task, without being reminded of the instructions.

Cybercruiser-II (Talbot & Kerns, 2014) is a computerized PM task in which children guide a spaceship while avoiding obstacles appearing in their way, thus earning points for every successfully avoided obstacle (ongoing task). After children are instructed how to guide the spaceship using the left-right arrows on the keyboard, they complete a practice session without the PM component. Upon finishing the practice trial, the PM component is introduced, namely children have to check the fuel level and to fill the gas tank when there is no more fuel in the spaceship as follows.

In the *time-based* version of the task, in addition to earning points for successfully avoided obstacles (ongoing task), children are instructed to secure their previously-earned points by ensuring that they won't remain out of fuel for the spaceship. Thus, participants had to monitor their gas tank, by checking the bar indicating the remaining fuel (using the G button on the keyboard). Children were instructed that they could fill up the gas tank only when the bar reached a red zone, indicating that they were low on fuel, by pressing the F button on the keyboard (PM action). If children ran out of fuel, an alarm sound went on, a message appeared on the screen, and their score went back to zero as the gas tank automatically refueled.

In the *event-based* version of the task, the PM instruction was again to remember to fill up the gas tank (by pressing the F button on the keyboard), but this time, to do so whenever a rainbow colored star (PM cue) appeared briefly on the screen among other stars. The task spans over five minutes, during which the rainbow star appears six times. Thus, children's event PM performance was reflected by the number of times they filled up their gas tank when cued by the rainbow star (score ranging from 0 to 6 points).

Episodic future thinking

A computerized "Daily quests" Episodic future thinking (EFT) task was designed to assess schoolchildren's EFT performance, based on the principles described by Atance și Sommerville (2014). In this task, children are instructed that they will simulate a day of their lives, in which they will prepare for several activities. Children are presented with twelve situation scenarios in which they encounter a problematic situation, which is to be solved at a later time, when given the opportunity during an activity.

After being presented with the first three problematic situation scenarios described below, children were engaged in a five-minute distracter task (i.e. one of the three NEPSY Inhibition subtests). After the distracter task, participants were offered the possibility to choose one item out of five, for each of the three problematic situations, without being

explicitly told why and where they could use that item. For example, children who first received the following scenario: "*You are home and you are hungry. You open the kitchen cabinet and you see your favorite cereals. However, when you look in the fridge, you can see that you have nothing left to eat them with.*" After presenting the remaining two situation scenarios and after the five-minute distracter task, children were told that they would stop at the supermarket, where they could buy one item: "*You go to the supermarket. What do you choose to buy? You can buy only one product because you don't have that much money on you"* (Choice question). The following slide on the computer screen showed pictures of five possible items of choice: a *milk bottle* (correct choice), dishwashing soap, an apple, a water bottle, bread. Children had to click on the desired item in order to purchase it.

After children chose the three items for the three corresponding situation scenarios, they were asked to explain why they chose that particular item (Explanation question: "*Why did you choose this object*?"). If they did not mention in their explanation the previously presented scenario (e.g."*I needed milk for the cereals*"), children were asked whether they remembered that particular situation scenario (Memory question). The scoring for this task included (1) children's *EFT choice* performance, representing their accuracy for item choice, with one point awarded for choosing the correct object to solve each previously presented scenario (score ranging from 0 to 12); (2) children's *EFT memory* performance, indicating their accuracy in remembering the previously presented scenarios (score ranging from 0 to 12).

Executive functions

Updating was measured using three verbal tasks from the Automated Working Memory Assessment (AWMA) battery (Alloway, 2007), and the Corsi Block Span task (Corsi, 1972). In two tasks, children heard an increasing list of made-up words (Nonword span) or digits (Digit Span) that they had to remember and reproduce after each presentation. In the Backward Digit Span task children heard increasing lists of spoken digits and had to recall them in reversed order. After three incorrect trials (out of six for each list length), testing was interrupted. *Corsi Block Span* was employed to tap children's visuospatial WM.

Inhibition. The *Inhibition and switching test* (NEPSY-II, Korkman, Kirk, & Kemp, 2007) is a timed-probe employing two cards depicting 40 black and white (1) shapes (circles and squares) and (2) arrows (pointing upward and downward). These stimuli are used in its three subtests: Naming, Inhibition and Switching. During the basic condition (i.e., Naming), children are required to name a series of 40 black and white shapes ("circle" or "square") and a series of 40 black and white arrows ("up" or "down") as quickly as possible. In the Inhibition test per se, children are instructed to name the same series of 40 stimuli according

to the "name the other" rule, thus naming squares "circle" or upward arrows "down" as quickly as possible.

Shifting. The Switching subtest (NEPSY-II, Korkman, Kirk, & Kemp, 2007) measures children's ability to engage their attentional control in accordance with alternating representations and rules, as they are required to switch between naming the stimuli and naming them according to the "name the other" rule. Thus, children were presented with the two series of 40 stimuli and instructed to name the true representation of the shape or arrow whenever the color of the stimulus was black, but switching to naming stimuli according to a "name the other rule" whenever the color was white.

Procedure

Following informed consent, children were administered the tasks individually, in two sessions, lasting for approximately one hour each. These two testing sessions were administered in a counterbalanced order, with a one-week period in-between sessions.

Results

Age, executive functioning, and episodic future thinking as predictors of event-based PM

To analyze age-related PM development, as well as specific contributions of EFs (updating, inhibition, shifting), and episodic foresight abilities (EFT memory and EFT choice to solve a problem), hierarchical multiple regressions were conducted for each event-based PM task.

The first model revealed that age accounted for a significant portion of variance in children's performances on both event-based tasks (12% and 8%, respectively). When the EFs were added in Model 2, age was no longer a significant predictor of children's PM abilities, as variance in their PM performance on both tasks was accounted by their updating and inhibition abilities (but not shifting). Higher PM scores were predicted by better updating and inhibition abilities. For each task, the inclusion of the EFs in the model accounted for approximately 16% additional variation over the model with age as the sole predictor. Although explaining a significant proportion of children's PM variance (R^2 = 27, p < .001 for Fishing, R^2 = 20, p = .001 for Cybercruiser II), the final model incorporating EFT-related abilities did not significantly account for additional variation. Nevertheless, the regression analysis revealed that, when accounting for all other predictors, children's retrospective memory for the EFT scenarios significantly predicted a better performance on the Fishing Game, β = .31, p = .046.

Age, executive functioning, and episodic future thinking as predictors of time-based PM

Similar hierarchical models were employed for children's scores on each time-based PM task. An extra step was added employing time-monitoring (Model 3), followed by retrospective memory and EFT (Model 4). First, Model 1 revealed that age was a significant predictor for children's time-based PM. However, the proportion of variance explained by age differed considerably between tasks, such that it accounted for 23% of the Fishing Game performance variance, and for 7% of children's performance on the Cybercruiser II. Moreover, the subsequent models employed to account for children's performance on the Fishing Game did not bring significant improvements to this initial model ($p \geq .15$), and age remained the sole predictor of children's PM scores when all factors were considered simultaneously, $\beta = .35$, $p = .015$, $R^2 = .32$.

Regarding children's time-based performance on the Cybercruiser II, when EF measures were added in the regression model, age was no longer indicative of their PM scores, whereas updating was the only significant EF predictor, $\beta = .32$, $p = .034$. Although now accounting for 14% of the total PM variance, this second model did not significantly increase the explained variance ($p = .14$). Nevertheless, adding children's time-monitoring checks in a third step significantly increased the explained PM variance, this model accounting for 43% of children's PM performance. In this model (Model 3), updating was a marginally significant predictor of higher PM scores, $\beta = .24$, $p = .053$, whereas the amount of times children checked for the remaining fuel was a robust predictor of their engagement in the PM action, $\beta = .56$, $p < .001$.

Age, executive functioning, and episodic future thinking as predictors of activity-based PM

In order to predict the odds of passing the activity-based PM task based on children's age, EFs, and EFT abilities, we employed a binary logistic regression. Similar to the multiple linear regressions employed for the event- and time-based performances, predictors were introduced hierarchically: age (Model 1), EFs: updating, inhibition, and shifting (Model 2), and episodic foresight-related abilities (Model 3). The first model revealed age significantly explained the performance variance in children's activity-based PM, Model $\chi^2(1) = 10.93$, $p = .001$. As such, for every one-year increase in age, the odds of passing the activity-based PM task increased by a factor of 2.08 ($B = .73$, $SE = .249$, $Exp(B) = 2.08$, 95% CI [1.28, 3.39], $p = .003$).

Discussions[5]

The present study aimed to (1) analyze age-related PM improvement, as well as specific contributions of EFs (updating, inhibition, shifting), and episodic foresight abilities (EFT memory and EFT choice to solve a problem) in schoolchildren; and to (2) identify, for the first time, whether these contributions vary across different types of PM tasks (event-, time- and activity-based). Given specific previous findings as a function of the task used to measure event- and time-based PM in children (e.g., Talbot & Kerns, 2014; Yang et al., 2011), two of the most widely used computerized tasks (Cybercruiser II and Fishing Game) were administered to highlight potential performance differences as a function of specific cognitive resources deployed by task specificities.

Overall, results revealed that across all tasks, age as a single predictor significantly explained children's PM variance, such that performance on all PM tasks improved with increasing age. However, on both event-based tasks, the effect of age was accounted by children's updating and inhibition abilities. Nevertheless, the situation was substantially different with regards to children's time-based PM. Although updating also accounted for the effect of age on children's PM performance on the time-based version of the Cybercruiser II, none of the EF and EFT abilities accounted for the effect of age on children's PM on the Fishing Game. Other task-related specific contributors were revealed, as (1) children's performance on the event-based Fishing Game was also predicted by their retrospective memory performance, and (2) a robust predictor of children's time-based Cybercruiser PM was their time-monitoring (i.e., the amount of times they checked to see if they were running out of fuel).

In conclusion, the present study extends the growing body of literature on PM development during middle childhood in several meaningful ways. It provides a more nuanced comprehension of age-related increments across the 6- to 10-year age band by revealing that PM development varies as a function of the cognitive resources recruited by differential PM requirements (event-, time-, activity-based), but also by differential qualities of tasks measuring the same PM ability. First, our findings demonstrate age-related increments of executive functioning, EFT abilities, and event-, time-, and activity-based PM. However, on PM tasks requiring more strategic monitoring for the cue and self-initiation processes, age-related PM increments were accounted by children's executive resources. Specifically, age-related improvements were explained by better updating (all these tasks), inhibitory control (event-based tasks), and/or specific time-monitoring abilities for the time-based PM task requiring active monitoring for time passage in the absence of cues

[5] We would like to thank to Professor Kimberly A. Kerns for kindly providing access to the CyberCruiser II task and to Professor Raymond C. K. Chan for offering access to the Super Little Fisherman task.

(Cybercruiser II). In contrast, children's age-related improvements on the other two PM tasks may be reliant on other developmentally sensitive processes, such as time knowledge acquisition and numerical skills (time-based Fishing Game employing implementing a PM action when a depicted digital clock reached 1:00 minutes), or experience with following activities in a certain order (activity-based PM). Finally, while confirming the EFT-PM link in the case of the same PM tasks require more strategic monitoring and self-initiation processes (event-based PM tasks, time-based Cybercruiser II), findings suggest that this link is mostly accounted by basic cognitive processes supporting children's EFT (i.e., EFs and retrospective memory capacity). As this is the first study to examine the contributions of executive functioning (updating, inhibition, shifting) and episodic foresight abilities (EFT retrospective memory and EFT performance) to specific types of PM tasks (event-, time- and activity-based) in schoolchildren, findings bring a substantial contribution to understanding cognitive processes underpinning PM development.

CHAPTER 5

Living in history and by the cultural life script: What events modulate autobiographical memory organization in a sample of older adults from Romania?[6]

Introduction

Apart from times of radical and often unanticipated changes such as the current pandemic crisis, our everyday lives are often repetitive, we tend to follow certain routines, live in the same location and mostly meet the same individuals. Within these habitual routines, minor changes might alter our daily life: we discover a new hobby, a close friend moves away from our city, we start a new exercise routine, get a new pet and so on. However, sometimes, big changes might suddenly occur that make a significant difference in how our lives unfold such as: marriage, birth of a child, death of a loved one, a car accident and so on. These events can dramatically shift our life course and initiate a new chapter in our existence (Brown, 2016).

Transition Theory

One theory that aims to investigate autobiographical memory starting from these observations is the *Transition Theory* (T^2). This theoretical framework (Brown, 2016) takes into consideration both the repetitive nature of everyday lives, as well as the impact that major transitional events have on the organization of autobiographical memory. A transition is defined as an event that determines a lasting change in the life of an individual. Some transitions can be minor (e.g. such as reaching the second year of college) when the changes to one's life are not so widespread and do not affect many aspects of a person's life (Zebian & Brown, 2014). On the other hand, major transitions (e.g. moving to a different city) can make a substantial difference, putting an end to one period of time with a set of familiar events and leading to an encounter of novel and less familiar events.

A type of transitional events can take the distinct form of public or historical events. Transition Theory posits that such major events can create Historically Defined Autobiographical Periods or H-DAPs (Brown et al., 2009). HDAPs are created when a public event or a series of events determine a pivotal change in the lives of a certain population and profoundly impact the fabric of everyday life. The *Living-in-History* (LiH) effect appears

[6] This chapter has been submitted to *Memory:* Opris, Brown, Ursan, Bobos & Visu-Petra (2020). Living in history and by the cultural life script: What events modulate autobiographical memory organization in a sample of older adults from Romania?

when individuals use historical landmark events to organize their autobiographical memory. Examples for historical events that can spawn HDAPs and determine a LiH effect are according to Brown and collaborators (2009, pp. 399-400): war, terrorism, natural calamities, as these events can generate "*economic hardship, social disruption, and psychological distress*."

Importantly, the strength of the LiH effect is directly related to the magnitude of change in everyday life (Zebian & Brown, 2014), with results differing on the region of study. Nourkova and Brown (2015) studied the impact of the Collapse of the Soviet Union in samples from Russia, Azerbaijan, and Uzbekistan. They expected that if this event produced a material change in the lives of individuals, it might spawn HDAPs. The researchers surprisingly found no LiH effect in either samples, with only 1.1% of the protocol datings referring to the Collapse. A potential explanation could be that this historical event did not have an enduring and life-altering impact on normal people's lives.

Since there are no studies that dealt with this issue in a Romanian sample, we were interested to pursue this investigation, and study whether the political revolution from 1989 in Romania which signaled the fall of the communist regime made a lasting impact on people lives, especially as it is known that the fall of the Soviet union determined an economical decline in the following years in the constituent countries of the union (Nourkova & Brown, 2015).

Cultural life script theory

Personal transitions can be *normative*, reflecting a cultural expectation that an individual should go through certain milestones at a specific age (e.g. going to school, getting a job) usually in a chronological order. These events are also prototypical to a certain culture and semantic in nature, meaning that they do not necessarily represent personal memories, but are normative and cultural views that play a structuring role for autobiographical memories (Janssen & Rubin, 2011).

The *Cultural Life Script Theory* (Berntsen & Rubin, 2004; Rubin & Berntsen, 2003) theorizes autobiographical memory as shaped by cultural schemas. The most crucial normative events, marking a transition from one life chapter to another represent the cultural life script (Rubin & Berntsen, 2003. When people date life events linked to these cultural life script transitions, they use these events as the "*normative skeleton of their life stories*" (Bohn & Habermas, 2016, pp. 4). A study that looked at how individuals recall their most crucial life events showed that almost 70% of participants' life stories could be encompassed by the cultural life script category of events (Bohn, 2010). Moreover, Bohn and Habermas (2016)

showed that at least a third of the overall justified memory protocol datings from the two samples (from Northern Germany or Berlin) made reference to culturally scripted events.

Current study

In the present investigation, we tested several predictions of the *Transition Theory* (Brown, 2016) and the *Cultural Life Script Theory* (Rubin & Berntsen, 2003) in a Romanian sample of elderly participants. Based on the *Transition Theory*, we hypothesized that*:* (1a) there will be a moderate LiH effect for the fall of communism in Romania in our sample (Nourkova & Brown, 2015), and (1b) we will find a marked material change in their lives reported by participants in relation to the fall of communism (if the LiH effect was indeed moderate).

With regard to the *Cultural life script Theory*, in the current study we expected to find similar results to the investigation by Bohn and Habermas (2016), namely that (2) a high proportion of protocol datings would make references to life script events.

Method

Participants

Participants were 39 individuals (14 males, 25 females), ranging in age from 59 to 90 years (M = 69.76, SD = 8.26), residents in a city from the Northwestern part of Romania. They were recruited from two day care centers. The testing session lasted for approximately 60-90 minutes. 30 participants completed a questionnaire measuring depression and anxiety. Due to contextual factors, 6 participants did not complete the transitional impact inventory and 5 lacked the fusion scales. All participants gave their informed written consent to participate in the study. All participants were at least 20 years old in 1989, which is the anticipated historical reference point when the Revolution took place.

Materials and procedure

First, participants completed several questionnaires, in the following standard order: DASS 21-R, PRMQ, and the MMSE-2. Next, we assessed autobiographical memory, by employing a two phase procedure described below.

Mini-Mental State Examination 2 (*MMSE-2*, Folstein, Folstein, White, & Messer, 2010; (Munteanu, Iliescu, & Livinţi, 2013, for the Romanian adaptation) is a test that evaluates general cognitive functioning and is a widespread screening measure in order to detect cognitive decline. The total maximum score is 30 points, with a lower score indicating a higher cognitive impairment. Internal consistency for the standard version of the task translated in Romanian is .80.

Prospective and retrospective memory questionnaire (*PRMQ*; Smith et al., 2000) is an inventory including 16 questions that measure everyday memory failures (prospective and retrospective). Participants rated the frequency with which they experienced each memory error described on the questionnaire on a 5-point Likert scale ranging from *never* to *very often*. Higher scores indicated more everyday problems reported. The PRMQ scale has good reliability (Crawford, Smith, Maylor, Della Sala, & Logie, 2003), with α Cronbach's value of .89.

Depression, Anxiety and Stress Scale (*DASS 21-R*, Lovibond & Lovibond, 1995; Perţe & Albu, 2011) is a 21 item inventory designed to measure symptoms of depression, anxiety and stress. The scale is divided equally in three subscales measuring the three types of emotional states. Participants rated each statement from 0 to 3 (*Did not apply to me at all* to *Applies to me very much*). The total score for each subscale is obtained by summing up the scores for the 7 items corresponding to each subscale. Internal consistency for the Romanian version of the questionnaire (Albu, 2011) is α = 0.86 (Anxiety subscale), α = 0.85 (Depression subscale), and α = .87 (Stress subscale).

Autobiographical memory task

Following the procedure described by Brown and collaborators (2009), we presented each participant with 20 cards that had a cue word printed on them (*automobile, bag, ball, book, box, bread, chair, coat, dog, pencil, piano, pill, radio, river, snow, spoon, stone, street, tree, window*). The words *automobile* and *chair* were used as a practice trial and were always presented first and second. During *phase 1*, participants were presented with 20 cue words written on cards and asked to generate and write down a personal and specific memory related to that particular cue, a memory that happened at least one week ago. During *phase 2*, after participants wrote each memory on the presented cards, they were asked to say out loud when that recalled event happened and to write down on the card a month and a year representing an approximate date when that particular event took place. In this dating phase, participants could refer to any particular time when that event took place and could also make reference to specific public or historical events when dating that memory (e.g. it was in 1989, when the Revolution happened).

Transitional impact scale (*TIS*, Svob, Brown, Reddon, Uzer, & Lee, 2014) is a scale that consists of 12 items that refer to how they were affected by a specific transitional moment. Half of the questions asked the participant to rate how this particular event (1989 Revolution) changed their material circumstances (items 1-6) and the remaining questions (items 7-12) referred to the psychological impact the event had on their life. In our particular study, participants were asked to rate (from 1-disagree to 5-completely agree) their level of

agreement with each question, by thinking of the fall of the communist regime in Romania in 1989.

Identity fusion scales were used the degree to which individuals identified with a certain group of reference. We used two scales (described below), one pictorial and one verbal, asking participants how much they identified with their *country*, their *family* and their *ethnic* group.

The pictorial measure of fusion (Swann, Gómez, Seyle, Morales, & Huici, 2009) includes a series of two circles representing the self and the social group that had different levels of interconnectedness (they were either far apart or gradually overlapping). Therefore, participants could choose from *A* to *E* (coded from 1 to 5) the figure that represented how much they identified with the reference group, with figure A showing no overlap and figure E depicting two circles, one smaller circle representing the self being encompassed in a larger circle (representing the reference group). Test retest stability of the pictorial scale was good, $r(618) = .56$, $p < .001$ (Gómez et al., 2011).

The verbal measure of fusion (Gómez et al., 2011). This measure is an alternative more detailed version of the pictorial fusion scale in which participants chose the degree to which they feel connected to the group of reference (feeling of oneness). The scale includes 7 items including statements such as "I am one with my country". For each item, participants rated the extent to which they felt that the question indicated their relationship with the group of reference (e.g. country) on a scale from 0 (strongly disagree) to 6 (strongly agree).

Coding scheme

We used the coding protocol created by Brown and collaborators (2009) in order to rate each event memory (generated at phase 1) as acceptable, unacceptable, or acceptable based on the verbal protocol. *Acceptable* meant that the event was personal, took place at least 1 week ago and could be localized in a specific time frame and place, during a certain day (e.g. "I went to a beautiful piano concert with my family once – it was a wonderful evening").

The scoring on the verbal protocol (generated at phase 2) was based on the premise that individuals tend to reconstruct the memory date when a particular event has occurred, meaning that in order to recall when a particular event took place, an individual uses several types of information, such as contextual features (Friedman, 2004). In our study, we were interested in distinct historical events that shape the organization of long term memory (in our case the fall of communism in Romania in the year 1989). Therefore, in our study, each verbal dating protocol generated by participants was assigned to one of the four main categories representing *justified* responses (offered an explication for the date of the event), or

it was rated as *unjustified* if a date estimate was given without any further explanation as to why that particular date was chosen. Protocols that made reference to certain historical, economic or political events were included in the *historical* category. Importantly, we rated two types of dating protocols here: (a) associated with the fall of communism if the participant dated a memory in connection to this historical moment, (b) any other historical period if the participant dated his memory as related to any other historical moments (e.g. World War 2).

In addition to earlier studies, we also included a *cultural life script* category. This included memory dating responses that referred to landmark personal events (Bohn & Habermas, 2016). The life script category includes 23 personal landmark event such as: our own birth, starting daycare, starting school, marriage, having children, going to school/college, getting employed for the first time, falling in love with someone, retiring, death of others, graduating school, reaching puberty, our own death, severe illness, the death of our parents, departing from home, having other brothers/sisters, making a first friend, getting divorced, first time having an intimate relationship, deciding for a certain career path, religious rituals such as communion. These events are universal key moments in an individual's life, reflecting a certain transition or change (Bohn & Habermas, 2016).

Results

Preliminary analyses

In the preliminary analyses we screened participants for cognitive decline (MMSE-2 and PRMQ) and for high levels of anxiety and depressive symptoms. One participant had a low score on the MMSE-2 (22 out of 30 maximum score), which could be indicative of a slight cognitive decline (MMSE total score $\geq$ 21). However, since the potential cognitive decline was not severe, we decided not to exclude any participant.

Main analyses

Living in history effect

Analyzing the number of cued elicited memories (phase 1) that were rated either unacceptable (not specific) or acceptable (specific), we concluded that out of a total of 692 written memories there were 142 event memories that were scored as unacceptable and 550 rated as acceptable

The following step in the coding process analyzed the content of the dating protocols (phase 2) for the 588 acceptable memory card elicited at phase 1. There were 85 unjustified protocols, leaving therefore a number of 503 justified dating protocols. Every justified dating protocol was screened for any reference to a historical or public event as well as the other coded categories. In our study, out of the 588 acceptable memory cards there were 422 justified dating protocols which we analyzed first for references to public or historical events. 23 dating protocols were classified as either historical, only or historical and personal/generic. From these historical dating protocols, only 4 mentions were regarding the fall of the communist regime in 1989 (the Revolution in 1989) and there were an additional 2 references of the "*Ceauşescu period*" (the Romanian president during the communist regime) while dating their memory. The participants also mentioned other historical events in their dating protocols, for example there was 1 mention of the Chernobyl Disaster, 6 references of being refugees during the World War 2 (before or after the WW2), another 5 mentions of the end of WW2, 2 references to the Bucharest earthquake from 1977, 1 mention of the first moon landing in 1969, 1 mention of the date when the Russian troops took over Czechoslovakia in 1968 and lastly there was another reference to a political protest in 2016 in Cluj-Napoca.

Cultural life script datings

Regarding participant's use of cultural life scripts in their dating protocol, we found 83 (16.50%) references to transitional personal events out of the total 503 justified dating protocols. The most frequently used life script category was *going to school- 23 (4.57%)*, followed by *other's death* - 10 (1.98%) and *parent's death* -10 (1.98%) *and the birth of a child* - 8 (1.59%). In comparison, the most frequently mentioned life script event in the study by Bohn & Habermas (2016) was the *birth of a child*. In our study, there was also an additional category mentioned by many participants which was not included in the study by Bohn & Habermas (2016), namely *moving to a different home/house* (5 mentions) or *city* (1 mention) and *celebrating birthday* (4 mentions).

Regarding the TIS scale, we obtained only modest mean scores for both the material change (M = 3.21, SD = 1.12), and the psychological change subscales (M = 2.92, SD = 1.30) as a result of the Revolution, compared to similar ratings (M = 3.33 overall average score across the three sample) found in the study by Nourkova and Brown (2015).

Discussions[7]

In the present study, we aimed to investigate the impact of the fall of communism on the organization of autobiographical memory in a Romanian sample. We wanted to test the prediction that historical events can lead to the formation of H-DAPs when they bring a profound change in individuals' everyday lives. Furthermore, we aimed to investigate whether participants will use cultural life script events in order to date their recalled memories.

Although the fall of the communist regime has brought a lot of change at the institutional, political and economic levels of the society, it seems it did not remain as strongly impregnated in the collective memory of the Romanians. Prior data supports this finding, reporting no LiH effect in connection to the Collapse of the Soviet Union in a Moscow sample (Bernstein, Nourkova, & Loftus, 2008). This lack of a LiH effect suggests that this particular event was not perceived as producing a radical change in our participants' everyday lives, not enough to spawn HDAPs and form a lifetime period, pre- and post- 1989 Revolution.

We found that participants used cultural life script events to date their recalled memories (16.50%). We did not reach the level reported by Bohn and Habermas (2016) in both their samples, as researchers reported that almost a third of their participants used cultural life script events in their datings. Interestingly, in our sample, *going to school* was the most frequent mentioned script category. A possibility might be that because our participants were older in our study (M_{age} = 69.76, *age range*: 59 – 90 years) therefore maybe they could have recalled easier those events that were closer to adult age.

This study provides support to the notion that individuals use both life scripts and personal events to organize their autobiographical memories (Berntsen & Rubin, 2012). We did not find any evidence of the LiH effect in our sample with regards to the fall of the communist regime, in line with previous investigations in samples from Russia, Azerbaijan, Uzbekistan (Nourkova & Brown, 2015) or Germany (Bohn & Habermas, 2016), suggesting that the impact of historical events on autobiographical memory depends on how profoundly the public event was engrained in the fabric of daily life.

[7] We would like to thank Professor Norman Brown for his guidance regarding the coding manual for the LiH effect and valuable insight regarding the LiH procedure

CHAPTER 6

Individual differences in past and future oriented thought: Conclusions

General conclusions

Thesis overview

The present thesis has examined **past and future thought behaviors** in order to offer a better understanding of these abilities across development. Additionally the scope of this thesis was to also investigate the impact of individual differences in age, anxiety, retrospective memory and executive functioning on these abilities. The **first chapter** presents a conceptualization of autobiographical memory, episodic future thinking and prospective memory together with methodological aspects concerning how these abilities are measured.

The **second chapter** describes the results of a study with school age children that addresses the impact of age and internalizing symptoms on verbal short term and working memory by employing a microanalysis of response time measures. The **third chapter** discusses a study with preschoolers in which we looked at the effect of individual differences (age, verbal ability, anxiety and emotional valence) on episodic future thinking performance. The **fourth chapter** presents a study with primary school children in which we investigated the role of executive functioning, retrospective memory and episodic future thinking in prospective memory development. The **fifth chapter** describes a study with adults in which we looked at how autobiographical memory is organized and the degree to which individuals rely on public or normative script-like events to recall personal memories. In the next section, we will discuss the main findings and propose future research directions in this rapidly growing scientific field (see Table 1 for a summary of the main results).

Table 1. Summary of main findings and conclusions

Study	Age range	Main variables	Task description	Main findings
Chapter 2 **Study 1**	11 years *N* = 125	Verbal short term memory Verbal working memory	**Verbal short term memory** measured with the Word Span and Nonword Span (AWMA battery). **Verbal working memory** measured with Listening span (AWMA battery).	1. Our findings show the role of internalizing symptoms to children's timing recall memory patterns (preparatory intervals, interword pauses, word durations). 2. Children with higher *state anxiety* had lower performance (accuracy) STM word span, and performance efficiency (took longer to prepare their answer and to pause during memory recall) on Nonword span and to prepare for their memory recall on Listening span. However these results concerning the link between state anxiety and memory efficiency (time taken to recall) were no longer significant when depressive symptoms were taken into account as a predictor. 3. *Trait anxiety* predicted negatively children's Listening span (WM span accuracy). Also higher trait anxiety predicted lower WM (in terms of interword pauses) and STM (in terms of word durations) performance efficiency. However, when depressive symptoms were taken into account, trait anxiety was no longer a significant predictor to STM performance efficiency (Word span word durations). 4. Higher depressive symptoms predicted lower performance efficiency on Word span (longer interword pauses). 5. In conclusion, our findings indicate that state and trait anxiety

				as well as depressive symptoms were negative predictors of performance efficiency.
Chapter 3 **Study 2**	3– 6 years N = 92	Verbal short term memory Episodic future thinking	**Verbal short term memory** was assessed with the *Word span* (AWMA battery). **Episodic future thinking (EFT)** was measured with item choice tasks. Children were presented with nine foresight scenarios that differed in their emotional valence: *neutral*, *motivational* or *aversive*. First, the problem scenario was presented to preschoolers in an initial room and then were told that they had to go to a second room where the child was presented with distracter games for 5 minutes. After which children were told that they had to return to the first room and were shown four possible items (one correct, another optional and two incorrect items) and asked to choose one object to take with them to the initial room (EFT choice). Children were not given any reminders regarding the initial scenario presented in the first room and were not explicitly told that the objects might be useful to them in order to solve the problem scenario.	1. Our findings revealed developmental improvements in children's episodic future thinking (EFT) performance in terms of better EFT choice accuracy. 2. We found that EFT memory (children's recall of the situation scenario initially presented to them) was a positive predictor to EFT choice. 3. Children's foresight performance depended on the valence of the scenario. Preschoolers had better EFT performance on the positive and neutral scenarios as compared to the negative one. However, as children progressed in their age, they improved their performance on the EFT negative condition. 4. Verbal ability predicted positively children's foresight performance. However this link was no longer significant when age was taken into account. 5. Our results also showed that *social anxiety* predicted lower overall EFT performance in preschoolers. However, when taking into consideration the valence of the EFT task, we found that high-anxious children had lower performance on the negative condition including an aversive scenario. 6. Our results suggest that highly anxious children probably have an impaired capacity to think of future solutions when the content of the foresight scenario presents fearful or socially uncomfortable situations.

Chapter 4 **Study 3**	6–10 years N = 82	Executive functions Episodic future thinking Prospective memory	***Updating*** **-** was measured using: Word span, Nonword Span, Backward digit span (AWMA battery) and a visual task: Corsi Block Span. ***Inhibition*** and ***Shifting*** were assessed with the Inhibition and Shifting Test (NEPSY-II). **Super Little Fisherman (Yang et al., 2011)** is a computerized PM task in which children are shown a boat with a cat on a fishpond. They had to catch as many fish as possible from the pond. When children were presented with a specific PM cue they had to interrupt their activity and feed the cat by clicking on it (*event-based PM task*). In the *time-based PM* task, children had to stop fishing and click on the cat when a clock on the screen showed 1, 2, and 3 minutes. In the *activity-based PM* task, children had to remember to click on a boat presented in the center of the screen, after they finished the event- or time-based PM tasks. **CyberCruiser II (Talbot & Kerns, 2014)** is a computerized PM task in which children are asked to drive a spaceship and avoid any obstacles on their way. In the *time-based PM task*, children had to check the fuel level of the spaceship and to fill up the gas tank when they ran out of fuel. In the *event-based PM* task, children were asked to put fuel in the gas tank when they saw a specific PM cue (a rainbow colored star). ***Episodic future thinking*** **(EFT)**: in this task, children are presented with a total of twelve situation scenarios. In these scenarios they encounter a problematic situation, which has to be solved at a later time by choosing from a set of several items the correct object (EFT choice) without being explicitly told why and where they could use that item.	1. Age predicted children's PM performance (event-based, time-based and activity-based), such that their accuracy improved as children were older. 2. On both *event-based PM tasks*, age related developments were explained by children's executive functions (*updating* and *inhibition*). Children's PM performance (event-based) was predicted additionally by their retrospective memory (EFT memory) on the Super Little Fisherman task. 3. On the *time-based PM task* (CyberCruiser), *updating* explained age improvements. Also, children's PM performance on this task was predicted by their time monitoring skills (how often children checked to see the fuel level in the gas tank). *4. Shifting* ability did not predict performance on any of the PM tasks, in contrast to the results by Zuber, Mahy and Kliegel (2009). 5. Unexpectedly, *EFT abilities* (memory and choice) did not predict performance on either of the PM tasks. 6. Our findings support the results of Zuber and collaborators (2019) in that we brought evidence that *updating* ability predicted event-based PM performance on both PM tasks as well as explained time-based PM performance on the CyberCruiser II. 7. Similar to previous findings (Zuber et al., 2019), *inhibition* predicted performance only on the event-based PM tasks but not the time-based PM tasks.

Chapter 5 **Study 4**	59–90 years N = 39	General cognitive functioning Autobiographical memory	**General cognitive functioning** was assessed with the *Mini-Mental State Examination 2.* **Autobiographical memory** was examined with a cuing method designed to assess the organization of autobiographical memory (Brown and collaborators, 2009). In this autobiographical memory task, we presented each participant with 20 cards that had a specific cue word printed on them (*automobile, chair, ball, bag, book, box, bread, coat, pencil, dog, piano, radio, pill, snow, river, spoon, street, stone, window, tree*). Participants were asked to recall a specific and personal memory that was related to each cue word and then to try to estimate by thinking out loud the date when that particular event occurred.	1. The results of the current investigation contradict the *proportionality prediction*, which argues that an important historical event will have a strong impact on autobiograhical memory. 2. Our results support the findings of Nourkova and Brown (2015) that failed to find a lasting impact of the collapse of the soviet union to participants's autobiographical memory organization (in terms of how many times they dated their memory by using this public event as a reference). 3. Furthermore, we found that almost a fifth of our participants used *cultural life script* events to date their personal memories. This supports the findings of Bohn and Habermas (2016), who reported that a third of their participants used cultural life scripts, which are normative events that mark transitions in an individual's life (e.g. getting married, graduating from college). 4. The most used life script event in our study was *going to school* as opposed to the most prevalent one in the German study by Bohn and Habermas (2016) which was *giving birth*. 5. Regarding the relation between anxiety or depressive symptoms and autobiographical memory specificity, we did not find a positive association, which does not support the assumptions of the CAR-FA-X model.

Theoretical and empirical contributions

Theoretical contributions

In what follows, we will interpret our findings in light of the scientific literature regarding the impact of individual differences in internalizing symptoms on autobiographical memory and episodic foresight.

Looking at the effect of individual differences in anxiety on EFT, studies conducted with adults have indicated an impaired problem solving ability in adults with nonclinical anxiety (Hallford et al., 2018). One potential candidate mechanism could be through executive functions. As we showed in our first study (Study 1), anxiety does have a detrimental impact on short term and working memory. These findings are in line with the *Attentional Control Theory* by showing anxiety related STM and WM efficiency impairments and additional accuracy WM deficits (as the WM task required additional demands).

Next, we investigated the link between anxiety and EFT in a preschool sample (Study 2). Our findings first indicate a clear age related improvement in foresight ability in our preschool age group, in line with previous results (Atance & Sommerville, 2014). Furthermore, results showed that young children with high anxiety present overal foresight deficits, especially visible when the problematic scenario involved a negative, uncomfortable scenario. This type of motivational foresight tasks have been employed in few previous investigations (Mahy, Grass, et al., 2014) in which the scenario involved a biological induced need (e.g. thirst). In our study (Study 2), the content of the foresight scenario had a social relevance, by asking children to envision a solution to a future problem that was uncomfortable. Our findings therefore, complement and extend the scientific literature.

Additionally, in a second study with an older age sample of primary schoolchildren (Study 3), we found that *age* was associated with better foresight ability, in line with previous findings showing similar age improvement in an episodic future thinking task (Ferretti et al., 2018). Also, prospective memory showed a steady progression as children in our study became older. Executive functioning (updating and inhibition) predicted prospective memory performance (event-based) above the contribution of age, in line with previous findings (Zuber et al., 2019). Taking together the findings from the three above mentioned studies, we showed that anxiety is associated with lower working memory and foresight (Study 1 and Study 2). Furthermore, executive functioning plays a significant role in prospective memory development (Study 3). Also, we showed in Study 2 and Study 3 that retrospective memory (episodic memory – EFT memory) predicts both foresight (in preschoolers) as well as prospective memory (in school age children). In our last study (Study 4) we looked at how

autobiographical memory is organized in the elderly. We found that personal events tend to be organized based on normative as well as personal landmark transitions.

Empirical contributions

Study 1. ***Internalising symptoms and verbal working memory in school-age children: A processing efficiency analysis***

- To our knowledge, this study is the first to investigate the relation betwen internalising symtoms (anxiety and depressive symptoms) and verbal short term and working memory performance efficiency at a high level of detail (response time microanalysis) in the same design;
- Our findings show that the most strategic executive intervals (preparatory intervals, interword durations) were negatively impacted by internalizing symptoms in both short term and working memory tasks. This findings complements past evidence regarding the impact of anxiety on STM (Visu-Petra et al., 2009) and STM and WM (Visu-Petra et al., 2011);

Study 2. ***Relating the development of episodic future thinking to cognitive and affective individual differences and to motivational relevance in preschoolers***

- To our knowledge, there are no previous investigations that examined the relationship between episodic future thinking and anxiety by employing an item choice paradigm to assess EFT;
- Untill now, to our knowledge, there are few EFT studies that have manipulated the valence of the problematic future scenario. This study revealed the impact of the *motivational valence* of the episodic future thinking task as children displayed their best performance in the positive condition, then the neutral and the negative condition.
- Another novel finding was that children with high social anxiety had lower performance on the negative EFT condition that implied a certain level of social exposure in the near future;

Study 3. ***Age-related increments in schoolchildren's prospective memory depend on the cognitive resources employed by the task***

- To our knowledge, this is the first study to investigate the contribution of both executive functioning and episodic future thinking to prospective memory by including all three types of PM tasks (event-, time- and activity- based) in a sample of school age children;

- In order to make the episodic future thinking task appropriate for older children, we created several computerized EFT tasks;

Study 4. ***Living in history and by the cultural life script: What events modulate autobiographical memory organization in a sample of older adults from Romania?***

- To our knowledge, there are few previous investigations examining both the Living in history effect and the presence of cultural life scripts in a Romanian sample of elders;
- We did find support for the Cultural life script theory in that participants employed life script events in order to date their autobiographical memories;

Practical implications

Our findings bring a useful contribution to the educational context as we can extrapolate some of our results to potential interventions. Our results indicate that young children with high social anxiety might find it particularly hard to envision and prepare for a future event. This suggests that potentially such children have less detailed retrospective memory representations which might make it more difficult to generate specific future solutions. Therefore, one suggestion could be to help such children recall and discuss in more detail their past memories by encouraging them to give more elaborate narrations when they recall a past experience. Also, another mechanism explaining such EFT deficits could be the tendency of anxious children to avoid thinking about fearful or uncomfortable scenarios. Episodic future thinking can be also improved through brief trainings, such as episodic specificity inductions (Jing, Madore, & Schacter, 2016) which were shown to boost problem solving and promote well-being.

Our results also show that executive functioning and foresight further contribute to prospective memory performance. This suggests that improving executive functioning might subsequently improve prospective memory. Another approach might be lowering the demands of the prospective memory task by using external reminders. This can be adapted in our daily life, by encouraging children to use visual reminders of their intentions and to write down when that action should be executed. In the same category of reminders, we might teach children to try to envision mentally the steps required to do a certain PM action. This was previously found to be particularly useful with children (Kretschmer-Trendowicz et al., 2019). Future research could investigate methodological approaches in examining this EFT ability as well as examine how this capacity develops across the lifespan in clinical and nonclinical groups. Potential interventions could be of paramount importance in assuring better day to day adjustment and improved well-being across all ages, from the early years to an older age.

References

Addis, D. R., Wong, A. T., & Schacter, D. L. (2007). Remembering the past and imagining the future: common and distinct neural substrates during event construction and elaboration. *Neuropsychologia*, *45*(7), 1363–1377.

Albu, M. (2011). O variantă redusă a Scalelor de Depresie, Anxietate şi Stress (DASS). *Anuarul Institutului de Istorie George Barițiu Din Cluj-Napoca. Seria Humanistica*, *tom. IX*, 287–294.

Alloway, T. P. (2007). *Automated Working Memory Assessment (AWMA).* London: Pearson Assessment.

Alloway, T. P., Gathercole, S. E., & Pickering, S. J. (2006). Verbal and visuospatial short-term and working memory in children: Are they separable? *Child Development*, *77*(6), 1698–1716. https://doi.org/10.1111/j.1467-8624.2006.00968.x

Altgassen, M., Rendell, P. G., Bernhard, A., Henry, J. D., Bailey, P. E., Phillips, L. H., & Kliegel, M. (2015). Future thinking improves prospective memory performance and plan enactment in older adults. *Quarterly Journal of Experimental Psychology*, *68*(1), 192–204. https://doi.org/10.1080/17470218.2014.956127

Arnold, N. R., Bayen, U. J., & Böhm, M. F. (2015). Is prospective memory related to depression and anxiety? A hierarchical MPT modelling approach. *Memory*, *23*(8), 1215–1228. https://doi.org/10.1080/09658211.2014.969276

Atance, C. M. (2018). Future‐thinking in young children: How do we measure it and how can we optimize it? In G. Oettingen, A. T. Sevincer, & P. Gollwitzer (Eds.), *The psychology of thinking about the future* (pp. 71–88). Guilford Press.

Atance, C. M., & Jackson, L. K. (2009). The development and coherence of future-oriented behaviors during the preschool years. *Journal of Experimental Child Psychology*, *102*(4), 379–391. https://doi.org/10.1016/j.jecp.2009.01.001

Atance, C. M., & Mahy, C. E. V. (2016). Episodic Future Thinking in Children. *Seeing the Future*, 367–386. https://doi.org/10.1093/acprof:oso/9780190241537.003.0018

Atance, C. M., & Meltzoff, A. N. (2006). Preschoolers' current desires warp their choices for the future. *Psychological Science*, *17*(7), 583–587. https://doi.org/10.1111/j.1467-9280.2006.01748.x

Atance, C. M., & O'Neill, D. K. (2001). Episodic future thinking. *Trends in Cognitive Sciences*, *5*(12), 533–539. https://doi.org/10.1016/S1364-6613(00)01804-0

Atance, C. M., & Sommerville, J. A. (2014). Assessing the role of memory in preschoolers' performance on episodic foresight tasks. *Memory*.

https://doi.org/10.1080/09658211.2013.820324

Baddeley, A. (2013). Working Memory and Emotion: Ruminations on a Theory of Depression. *Review of General Psychology*, *17*(1), 20–27. https://doi.org/10.1037/a0030029

Bahri, M., & Bahri, M. (2018). Research Paper: Comparison of Episodic Future Thinking and Working Memory in Adolescents With Internalizing Problems and Non-clinical Adolescents. *Journal of Practice in Clinical Psychology*, *6*(3), 183–190.

Benga, O., Tincas, I., & Visu-Petra, L. (2010). Investigating the structure of anxiety symptoms among Romanian preschoolers using the Spence Preschool Anxiety Scales. *Cognition, Brain, Behavior: An Interdisciplinary Journal*.

Bernstein, D. M., Nourkova, V. V., & Loftus, E. F. (2008). From Individual Memories to Oral History. In A. M. Columbus (Ed.), *Advances in Psychology Research* (Vol. 54, pp. 157–181). New York: Nova Science Publishers, Inc.

Berntsen, D., & Rubin, D. C. (2004). Cultural life scripts structure recall from autobiographical memory. *Memory and Cognition*, *32*(3), 427–442. https://doi.org/10.3758/BF03195836

Berntsen, D., & Rubin, D. C. (2012). Understanding autobiographical memory: Theories and approaches. In D. Berntsen & D. C. Rubin (Eds.), *Understanding autobiographical memory: Theories and approaches.* https://doi.org/10.1017/CBO9781139021937

Best, J. R., & Miller, P. H. (2010). A Developmental Perspective on Executive Function. *Child Development*, *81*(6), 1641–1660. https://doi.org/10.1111/j.1467-8624.2010.01499.x

Bohn, A. (2010). Generational Differences in Cultural Life Scripts and Life Story Memories of Younger and Older Adults. *Applied Cognitive Psychology*, *24*(9), 1324–1345. https://doi.org/10.1002/acp

Bohn, A., & Habermas, T. (2016). Living in history and living by the cultural life script: How older Germans date their autobiographical memories. *Memory*, *24*(4), 482–495. https://doi.org/10.1080/09658211.2015.1019890

Brown, G. P., MacLeod, A. K., Tata, P., & Goddard, L. (2002). Worry and the simulation of future outcomes. *Anxiety, Stress and Coping*, *15*(1), 1–17. https://doi.org/10.1080/10615800290007254

Brown, N R. (2016). Transition Theory: A Minimalist Perspective on the Organization of Autobiographical Memory. *Journal of Applied Research in Memory and Cognition*, *5*(2), 128–134. https://doi.org/10.1016/j.jarmac.2016.03.005

Brown, Norman R, Lee, P. J., Krslak, M., Conrad, F. G., Hansen, T. G. B., Havelka, J., & Reddon, J. R. (2009). Living in History. *Psychological Science*, *20*(4), 399–405.

https://doi.org/10.1111/j.1467-9280.2009.02307.x

Busby, J., & Suddendorf, T. (2005). Recalling yesterday and predicting tomorrow. *Cognitive Development*. https://doi.org/10.1016/j.cogdev.2005.05.002

Cejudo, A. B., Gómez-Ariza, C. J., & Teresa Bajo, M. (2019). The cost of prospective memory in children: The role of cue focality. *Frontiers in Psychology*, *9*(JAN), 1–8. https://doi.org/10.3389/fpsyg.2018.02738

Cheie, L., MacLeod, C., Miclea, M., & Visu-Petra, L. (2017). When children forget to remember: Effects of reduced working memory availability on prospective memory performance. *Memory and Cognition*, *45*(4), 651–663. https://doi.org/10.3758/s13421-016-0682-z

Cheie, L., Miclea, M., & Visu-Petra, L. (2014). What was i supposed to do? Effects of individual differences in age and anxiety on preschoolers' prospective memory. *International Journal of Behavioral Development*, *38*(1), 52–61. https://doi.org/10.1177/0165025413506132

Conway, M. A., Singer, J. A., & Tagini, A. (2004). The self and autobiographical memory: correspondence and coherence. *Social Cognition*, *22*(5), 491–529.

Conway, Martin A., & Pleydell-Pearce, C. W. (2000). The construction of autobiographical memories in the self-memory system. *Psychological Review*. https://doi.org/10.1037//0033-295x.107.2.261

Corsi, P. M. (1972). *Human Memory and the Medial Temporal Region of the Brain (Doctoral dissertation, McGill University, 1972)*. Dissertation Abstracts International.

Coughlin, C., Lyons, K. E., & Ghetti, S. (2014). Remembering the past to envision the future in middle childhood: Developmental linkages between prospection and episodic memory. *Cognitive Development*. https://doi.org/10.1016/j.cogdev.2014.02.001

Cowan, N., Towse, J. N., Hamilton, Z., Saults, J. S., Elliott, E. M., Lacey, J. F., … Hitch, G. J. (2003). Children's Working-Memory Processes: A Response-Timing Analysis. *Journal of Experimental Psychology: General*, *132*(1), 113–132. https://doi.org/10.1037/0096-3445.132.1.113

Crawford, J. R., Smith, G., Maylor, E. A., Della Sala, S., & Logie, R. H. (2003). The Prospective and Retrospective Memory Questionnaire (PRMQ): Normative data and latent structure in a large non-clinical sample. *Memory*, *11*(3), 261–275. https://doi.org/10.1080/09658210244000027

Cuevas, K., Rajan, V., Morasch, K. C., & Bell, M. A. (2015). Episodic memory and future thinking during early childhood: Linking the past and future. *Developmental Psychobiology*, *57*(5), 552–565. https://doi.org/10.1002/dev.21307

de Vito, S., Neroni, M. A., Gamboz, N., Della Sala, S., & Brandimonte, M. A. (2015).

Desirable and undesirable future thoughts call for different scene construction processes. *Quarterly Journal of Experimental Psychology*, *68*(1), 75–82. https://doi.org/10.1080/17470218.2014.937448

Einstein, G., & McDaniel, M. (1996). Retrieval processes in prospective memory: Theoretical approaches and some new empirical findings. In M. Brandimonte, G. O. Einstein, & M. A. McDaniel (Eds.), *Prospective memory: Theory and applications* (pp. 115–141). Lawrence Erlbaum Associates Publishers.

Einstein, G. O., McDaniel, M. A., Marsh, R. L., & West, R. (2007). Prospective memory: Processes, lifespan changes, and neuroscience. In *Learning and Memory: A Comprehensive Reference*. https://doi.org/10.1016/B978-012370509-9.00166-2

Einstein, Gilles O., & McDaniel, M. A. (1990). Normal Aging and Prospective Memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*. https://doi.org/10.1037/0278-7393.16.4.717

Einstein, Gilles O., & McDaniel, M. A. (2005). Prospective Memory. *Current Directions in Psychological Science*, *14*(6), 286–290. https://doi.org/10.1111/j.0963-7214.2005.00382.x

Ellis, J., & Kvavilashvili, L. (2000). Prospective memory in 2000: Past, present, and future directions. *Applied Cognitive Psychology*, *14*(7), S1–S9. https://doi.org/10.1002/acp.767

Eysenck, M. W., Derakshan, N., Santos, R., & Calvo, M. G. (2007). Anxiety and cognitive performance: Attentional control theory. *Emotion*, *7*(2), 336–353. https://doi.org/10.1037/1528-3542.7.2.336

Ferretti, F., Chiera, A., Nicchiarelli, S., Adornetti, I., Magni, R., Vicari, S., … Marini, A. (2018). The development of episodic future thinking in middle childhood. *Cognitive Processing*, *19*(1), 87–94. https://doi.org/10.1007/s10339-017-0842-5

Fivush, R. (2011). The Development of Autobiographical Memory. *Annual Review of Psychology*, *62*(1), 559–582. https://doi.org/10.1146/annurev.psych.121208.131702

Folstein, M. F., Folstein, S. E., White, T., & Messer, M. A. (2010). *MMSE-2: Mini-mental state examination 2nd Edition*. Psychological Assessment Resources, Inc., Lutz, FL.

Friedman, N. P., & Miyake, A. (2017, January 1). Unity and diversity of executive functions: Individual differences as a window on cognitive structure. *Cortex*, Vol. 86, pp. 186–204. https://doi.org/10.1016/j.cortex.2016.04.023

Fronda, G., Monti, C., Sozzi, M., Corbo, M., & Balconi, M. (2020). Prospective memory and working memory in comparison. New experimental paradigms. *International Journal of Neuroscience*, *0*(0), 000. https://doi.org/10.1080/00207454.2019.1707821

Garber, J., & Weersing, V. R. (2010). Comorbidity of Anxiety and Depression in Youth: Implications for Treatment and Prevention. *Clinical Psychology: Science and Practice*,

17(4), 293–306. https://doi.org/10.1111/j.1468-2850.2010.01221.x

Ghetti, S., & Coughlin, C. (2018). Stuck in the Present? Constraints on Children's Episodic Prospection. *Trends in Cognitive Sciences*, *22*(10), 846–850. https://doi.org/10.1016/j.tics.2018.07.013

Gómez, Á., Brooks, M. L., Buhrmester, M. D., Vázquez, A., Jetten, J., & Swann, W. B. (2011). On the Nature of Identity Fusion: Insights Into the Construct and a New Measure. *Journal of Personality and Social Psychology*, *100*(5), 918–933. https://doi.org/10.1037/a0022642

Gott, C., & Lah, S. (2014). Episodic future thinking in children compared to adolescents. *Child Neuropsychology*. https://doi.org/10.1080/09297049.2013.840362

Grant, J. B., & Suddendorf, T. (2010). Young children's ability to distinguish past and future changes in physical and mental states. *British Journal of Developmental Psychology*, *28*(4), 853–870. https://doi.org/10.1348/026151009X482930

Habermas, T. (2007). How to tell a life: The development of the cultural concept of biography. *Journal of Cognition and Development*. https://doi.org/10.1207/s15327647jcd0801_1

Hadwin, J. A., Brogan, J., & Stevenson, J. (2005). State Anxiety and Working Memory in Children: A test of processing efficiency theory. *Educational Psychology*, *25*(4), 379–393. https://doi.org/10.1080/01443410500041607

Hadwin, J. A., & Richards, H. J. (2016). Working Memory Training and CBT Reduces Anxiety Symptoms and Attentional Biases to Threat: A Preliminary Study. *Frontiers in Psychology*, *7*. https://doi.org/10.3389/fpsyg.2016.00047

Hallford, D. J., Noory, N., & Mellor, D. (2018). Reduced autobiographical memory specificity as a mediating factor between general anxiety symptoms and performance on problem-solving tasks. *Applied Cognitive Psychology*. https://doi.org/10.1002/acp.3428

Hanson, L. K., Atance, C. M., & Paluck, S. W. (2014). Is thinking about the future related to theory of mind and executive function? Not in preschoolers. *Journal of Experimental Child Psychology*, *128*, 120–137. https://doi.org/10.1016/j.jecp.2014.07.006

Hill, P. F., & Emery, L. J. (2013). Episodic future thought: Contributions from working memory. *Consciousness and Cognition*. https://doi.org/10.1016/j.concog.2013.04.002

Hudson, J. A., Mayhew, E. M. Y., & Prabhakar, J. (2011). The Development of Episodic Foresight. Emerging Concepts and Methods. In *Advances in Child Development and Behavior*. https://doi.org/10.1016/B978-0-12-386491-8.00003-7

Janssen, S. M. J., & Rubin, D. C. (2011). Age effects in cultural life scripts. *Applied Cognitive Psychology*, *25*(2), 291–298. https://doi.org/10.1002/acp.1690

Jing, H. G., Madore, K. P., & Schacter, D. L. (2016). Worrying about the future: An episodic

specificity induction impacts problem solving, reappraisal, and well-being. *Journal of Experimental Psychology: General*, *145*(4), 402–418. https://doi.org/10.1037/xge0000142

Kerns, K. (2000). The CyberCruiser: An investigation of development of prospective memory in children. *Journal of the International Neuropsychological Society*, *6*(1), 62–70. https://doi.org/10.1017/S1355617700611074

Kliegel, M., & Jäger, T. (2006). The influence of negative emotions on prospective memory: A review and new data. *International Journal of Computational Cognition*, *4*(1), 1–17.

Kliegel, M., Mahy, C. E. V, Voigt, B., Henry, J. D., Rendell, P. G., Aberle, I., & Kliegel, M. (2013). The development of prospective memory in young schoolchildren: The impact of ongoing task absorption, cue salience, and cue centrality. *Journal of Experimental Child Psychology*, *116*, 792–810. https://doi.org/10.1016/j.jecp.2013.07.012

Korkman, M., Kirk, U., & Kemp, S. (1998). *NEPSY: A Developmental Neuropsychological Assessment*. New York: The Psychological Corporation.

Korkman, M., Kirk, U., & Kemp, S. (2007). *NEPSY—Second Edition (NEPSY-II)*. San Antonio, TX: Harcourt Assessment.

Kovacs, M. (1992). *Children's Depression Inventory*. North Tonawanda: N.Y: Multi-Health Systems.

Kretschmer-Trendowicz, A., Schnitzspahn, K. M., Reuter, L., & Altgassen, M. (2019). Episodic future thinking improves children's prospective memory performance in a complex task setting with real life task demands. *Psychological Research*, *83*(3), 514–525. https://doi.org/10.1007/s00426-017-0908-0

Kretschmer-Trendowicz, Anett, Ellis, J. A., & Altgassen, M. (2016). Effects of episodic future thinking and self-projection on children's prospective memory performance. *PLoS ONE*, *11*(6), 1–16. https://doi.org/10.1371/journal.pone.0158366

Kretschmer, A., Voigt, B., Friedrich, S., Pfeiffer, K., & Kliegel, M. (2014). Time-based prospective memory in young children - Exploring executive functions as a developmental mechanism. *Child Neuropsychology*, *20*(6), 662–676. https://doi.org/10.1080/09297049.2013.841881

Levens, S. M., Muhtadie, L., & Gotlib, I. H. (2009). Rumination and Impaired Resource Allocation in Depression. *Journal of Abnormal Psychology*, *118*(4), 757–766. https://doi.org/10.1037/a0017206

Levine, B., Svoboda, E., Hay, J. F., Winocur, G., & Moscovitch, M. (2002). Aging and autobiographical memory: Dissociating episodic from semantic retrieval. *Psychology and Aging*, *17*(4), 677–689. https://doi.org/10.1037/0882-7974.17.4.677

Lovibond, S. H., & Lovibond, P. F. (1995). *Manual for the Depression Anxiety & Stress*

Scales. (2nd Ed.). Sydney: Psychology Foundation.

Mackinlay, R. J., Kliegel, M., & Mäntylä, T. (2009). Predictors of time-based prospective memory in children. *Journal of Experimental Child Psychology*, *102*(3), 251–264. https://doi.org/10.1016/j.jecp.2008.08.006

Mahy, C. E. V., Grass, J., Wagner, S., & Kliegel, M. (2014). These pretzels are going to make me thirsty tomorrow: Differential development of hot and cool episodic foresight in early childhood? *British Journal of Developmental Psychology*, *32*(1), 65–77. https://doi.org/10.1111/bjdp.12023

Mahy, C. E. V., Moses, L. J., & Kliegel, M. (2014). The development of prospective memory in children: An executive framework. *Developmental Review*, *34*(4), 305–326. https://doi.org/10.1016/j.dr.2014.08.001

McDaniel, M. A., & Einstein, G. O. (2000). Strategic and Automatic Processes in Prospective Memory Retrieval: A Multiprocess Framework. *Applied Cognitive Psychology*, *14*(November), 127–144.

Miloyan, B., & McFarlane, K. A. (2018). The measurement of episodic foresight: A systematic review of assessment instruments. *Cortex*, 1–20. https://doi.org/10.1016/j.cortex.2018.08.018

Miyake, A., & Shah, P. (1999). *Models of working memory: Mechanisms of active maintenance and executive control*. Retrieved from https://psycnet.apa.org/record/1999-02490-000

Moran, T. P. (2016). Anxiety and working memory capacity: A meta-analysis and narrative review. *Psychological Bulletin*, *142*(8), 831–864. https://doi.org/10.1037/bul0000051

Munteanu, C. E., Iliescu, D., & Livinţi, R. (2013). *MMSE-2; Mini-Mental State Examination, 2nd Edition, Manual de utilizare a testului*. Cluj-Napoca: Sinapsis.

Naito, M., & Suzuki, T. (2011). " When did I learn and when shall I act?": The developmental relationship between episodic future thinking and memory. *Journal of Experimental Child Psychology*, *109*(4), 397–411. https://doi.org/10.1016/j.jecp.2011.03.005

Neroni, M. A., Gamboz, N., & Brandimonte, M. A. (2014). Does episodic future thinking improve prospective remembering? *Consciousness and Cognition*, *23*(1), 53–62. https://doi.org/10.1016/j.concog.2013.12.001

Ng, E. L., & Lee, K. (2015). Effects of trait test anxiety and state anxiety on children's working memory task performance. *Learning and Individual Differences*, *40*, 141–148. https://doi.org/10.1016/j.lindif.2015.04.007

Nigro, G., Brandimonte, M. A., Cicogna, P. C., & Cosenza, M. (2014). Episodic future thinking as a predictor of children's prospective memory. *Journal of Experimental Child*

Psychology, *127*, 82–94. https://doi.org/10.1016/j.jecp.2013.10.013

Nourkova, V. V., & Brown, N. R. (2015). Assessing the Impact of "The Collapse" on the Organization and Content of Autobiographical Memory in the Former Soviet Union. *Journal of Social Issues*, *71*(2), 324–337. https://doi.org/10.1111/josi.12113

Opris, A. M., Cheie, L., Trifan, C. M., & Visu-Petra, L. (2018). Internalising symptoms and verbal working memory in school-age children: A processing efficiency analysis. *International Journal of Psychology*. https://doi.org/10.1002/ijop.12537

Owens, M., Stevenson, J., Hadwin, J. A., & Norgate, R. (2012). Anxiety and depression in academic performance: An exploration of the mediating factors of worry and working memory. *School Psychology International*, *33*(4), 433–449. https://doi.org/10.1177/0143034311427433

Perţe, A., & Albu, M. (2011). *DASS 21−R. Adaptarea şi standardizarea DASS pe populaţia din România*. Cluj-Napoca: ASCR.

Prabhakar, J., & Ghetti, S. (2019). Connecting the Dots Between Past and Future: Constraints in Episodic Future Thinking in Early Childhood. *Child Development*, *00*(0), 1–16. https://doi.org/10.1111/cdev.13212

Redshaw, J., & Bulley, A. (2018). Future-thinking in animals: Capacities and limits. In G. Oettingen, A. T. Sevincer, & P. Gollwitzer (Eds.), *The Psychology of thinking about the future* (pp. 31–51). Guilford Press.

Rubin, D. C., & Berntsen, D. (2003). Life scripts help to maintain autobiographical memories of highly positive, but not highly negative, events. *Memory and Cognition*, *31*(1), 1–14. https://doi.org/10.3758/BF03196077

Russell, J., Alexis, D., & Clayton, N. (2010). Episodic future thinking in 3- to 5-year-old children: The ability to think of what will be needed from a different point of view. *Cognition*, *114*(1), 56–71. https://doi.org/10.1016/j.cognition.2009.08.013

Schacter, D. L., & Addis, D. R. (2007). The cognitive neuroscience of constructive memory: Remembering the past and imagining the future. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *362*(1481), 773–786. https://doi.org/10.1098/rstb.2007.2087

Schacter, D. L., Benoit, R. G., & Szpunar, K. K. (2017). Episodic future thinking: mechanisms and functions. *Current Opinion in Behavioral Sciences*, *17*, 41–50. https://doi.org/10.1016/j.cobeha.2017.06.002

Schacter, D. L., & Madore, K. P. (2016). Remembering the past and imagining the future: Identifying and enhancing the contribution of episodic memory. *Memory Studies*, *9*(3), 245–255. https://doi.org/10.1177/1750698016645230

Schmeichel, B. J., & Tang, D. (2015). Individual Differences in Executive Functioning and

Their Relationship to Emotional Processes and Responses. *Current Directions in Psychological Science*, *24*(2), 93–98. https://doi.org/10.1177/0963721414555178

Smith, G., Della Sala, S., Logie, R. H., & Maylor, E. A. (2000). Prospective and retrospective memory in normal ageing and dementia: A questionnaire study. *Memory*, *8*(5), 311–321. https://doi.org/10.1080/09658210050117735

Spence, S. H., Rapee, R., McDonald, C., & Ingram, M. (2001). The structure of anxiety symptoms among preschoolers. *Behaviour Research and Therapy*, *39*(11), 1293–1316. https://doi.org/10.1016/S0005-7967(00)00098-X

Spielberger, C. D. (1973). *Manual for the state trait anxiety inventory for children.* Palo Alto: Consulting Psychologists Press.

Suddendorf, T. (2017). The Emergence of Episodic Foresight and Its Consequences. *Child Development Perspectives*, *11*(3), 191–195. https://doi.org/10.1111/cdep.12233

Suddendorf, T., & Busby, J. (2005). Making decisions with the future in mind: Developmental and comparative identification of mental time travel. *Learning and Motivation*, *36*(2 SPEC. ISS.), 110–125. https://doi.org/10.1016/j.lmot.2005.02.010

Suddendorf, T., Nielsen, M., & Von Gehlen, R. (2011). Children's capacity to remember a novel problem and to secure its future solution. *Developmental Science*, *14*(1), 26–33. https://doi.org/10.1111/j.1467-7687.2010.00950.x

Svob, C., Brown, N. R., Reddon, J. R., Uzer, T., & Lee, P. J. (2014). The transitional impact scale: Assessing the material and psychological impact of life transitions. *Behavior Research Methods*, *46*(2), 448–455. https://doi.org/10.3758/s13428-013-0378-2

Swann, W. B., Gómez, Á., Seyle, D. C., Morales, J. F., & Huici, C. (2009). Identity Fusion: The Interplay of Personal and Social Identities in Extreme Group Behavior. *Journal of Personality and Social Psychology*, *96*(5), 995–1011. https://doi.org/10.1037/a0013668

Szpunar, K. K., & Radvansky, G. A. (2016). Cognitive approaches to the study of episodic future thinking. *Quarterly Journal of Experimental Psychology*, *69*(2), 209–216. https://doi.org/10.1080/17470218.2015.1095213

Szpunar, K. K., Spreng, R. N., & Schacter, D. L. (2014). A taxonomy of prospection: Introducing an organizational framework for future-oriented cognition. *Proceedings of the National Academy of Sciences*, *111*(52), 18414–18421. https://doi.org/10.1073/PNAS.1417144111

Talbot, K. D. S., & Kerns, K. A. (2014). Event- and time-triggered remembering: The impact of attention deficit hyperactivity disorder on prospective memory performance in children. *Journal of Experimental Child Psychology*, *127*, 126–143. https://doi.org/10.1016/j.jecp.2014.02.011

Tandon, M., Cardeli, E., & Luby, J. (2009). Internalizing Disorders in Early Childhood: A

Review of Depressive and Anxiety Disorders. *Child and Adolescent Psychiatric Clinics of North America*, *18*(3), 593–610. https://doi.org/10.1016/j.chc.2009.03.004

Terrett, G., Horner, K., White, R., Henry, J. D., Kliegel, M., Labuschagne, I., & Rendell, P. G. (2019). The relationship between episodic future thinking and prospective memory in middle childhood: Mechanisms depend on task type. *Journal of Experimental Child Psychology*, *178*, 198–213. https://doi.org/10.1016/j.jecp.2018.10.003

Terrett, G., Rose, N. S., Henry, J. D., Bailey, P. E., Altgassen, M., Phillips, L. H., … Rendell, P. G. (2016). The relationship between prospective memory and episodic future thinking in younger and older adulthood. *Quarterly Journal of Experimental Psychology*, *69*(2), 310–323. https://doi.org/10.1080/17470218.2015.1054294

Tulving, E. (2005). *Episodic memory and autonoesis: Uniquely human?* Retrieved from https://philpapers.org/rec/tulema

Visu-Petra, L. (2008). *The multidimensional development of executive functioning: A neuropsychological approach* (ASCR Print). Cluj-Napoca.

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

Visu-Petra, L., Miclea, M., Cheie, L., & Benga, O. (2009). Processing efficiency in preschoolers' memory span: Individual differences related to age and anxiety. *Journal of Experimental Child Psychology*, *103*(1), 30–48. https://doi.org/10.1016/j.jecp.2008.09.002

Visu-Petra, L., Miclea, M., & Visu-Petra, G. (2013). Individual differences in anxiety and executive functioning: A multidimensional view. *International Journal of Psychology*, *48*(4), 649–659. https://doi.org/10.1080/00207594.2012.656132

Visu-Petra, L., & Opris, M. A. (2019). Episodic future thinking: early development and relation with anxiety and depression symptoms. In Buchwald, Moore, Kaniasty, & Arenas-Landgrave (Eds.), *Stress and Anxiety: Contributions of the STAR Award Winners* (pp. 111–123). Berlin: Logos.

Voigt, B., Mahy, C. E. V., Ellis, J., Schnitzspahn, K., Krause, I., Altgassen, M., & Kliegel, M. (2014). The development of time-based prospective memory in childhood: The role of working memory updating. *Developmental Psychology*, *50*(10), 2393–2404. https://doi.org/10.1037/a0037491

Wang, Q., Capous, D., Koh, J. B. K., & Hou, Y. (2014). Past and Future Episodic Thinking in Middle Childhood. *Journal of Cognition and Development*, *15*(4), 625–643. https://doi.org/10.1080/15248372.2013.784977

Williams, J. M. G., Barnhofer, T., Crane, C., Herman, D., Raes, F., Watkins, E., & Dalgleish,

T. (2007). Autobiographical memory specificity and emotional disorder. *Psychological Bulletin*, *133*(1), 122–148. https://doi.org/10.1037/0033-2909.133.1.122

Wolf, T., & Zimprich, D. (2015). Differences in the use of autobiographical memory across the adult lifespan. *Memory*, *23*(8), 1238–1254. https://doi.org/10.1080/09658211.2014.971815

Wu, J. Q., Szpunar, K. K., Godovich, S. A., Schacter, D. L., & Hofmann, S. G. (2015). Episodic future thinking in generalized anxiety disorder. *Journal of Anxiety Disorders*, *36*, 1–8. https://doi.org/10.1016/j.janxdis.2015.09.005

Yang, T. xiao, Chan, R. C. K., & Shum, D. (2011). The Development of Prospective Memory in Typically Developing Children. *Neuropsychology*, *25*(3), 342–352. https://doi.org/10.1037/a0022239

Zebian, S., & Brown, N. R. (2014). Living in History in Lebanon: The influence of chronic social upheaval on the organisation of autobiographical memories. *Memory*, *22*(3), 194–211. https://doi.org/10.1080/09658211.2013.775310

Zhao, X., Fu, J., Ma, X., & Maes, J. H. R. (2019). Age Differences in Prospective Memory: A Further Evaluation of the Executive Framework. *Journal of Cognition and Development*, *20*(5), 680–701. https://doi.org/10.1080/15248372.2019.1648268

Zuber, S., Mahy, C. E. V., & Kliegel, M. (2019). How executive functions are associated with event-based and time-based prospective memory during childhood. *Cognitive Development*, *50*(August 2018), 66–79. https://doi.org/10.1016/j.cogdev.2019.03.001