Journal of Experimental Child Psychology 246 (2024) 105985

Contents lists available at ScienceDirect

Journal of Experimental Child Psychology

journal homepage: www.elsevier.com/locate/jecp

Episodic foresight, episodic memory, and executive functions in children engaged with Child Protective Services: The role of cumulative risk

Sanmya Salomão *, Ana Catarina Canário, Orlanda Cruz

Faculty of Psychology and Education Sciences of the University of Porto, 4200-135 Porto, Portugal

ARTICLE INFO

Article history:

Keywords:
Episodic foresight
Episodic memory
Executive functions
Cumulative risk
School-aged children
Child Protective Services

ABSTRACT

Previous studies have determined that exposure to risk and adversities may impair children's cognitive abilities. In particular, children engaged with Child Protective Services (CPS) seem to be at greater risk for enhanced detrimental effects resulting from the cumulative risk factors to which they are exposed. However, little is known about children's future thinking when they face adverse circumstances, and it is not clear how the associations among episodic foresight abilities, episodic memory, and executive functions work with children under such circumstances. The current study describes the episodic foresight abilities of CPS-involved school-aged children, its association with other cognitive abilities, and how this association is affected by the exposure to cumulative risk and adversity factors. Episodic foresight, episodic memory, executive functions, and a composite of cumulative risk factors were analyzed in a sample of 95 school-aged children engaged with CPS in Portugal. Results suggest the detrimental effect of cumulative risk on the episodic foresight abilities of CPS-involved children. Episodic memory and cognitive flexibility were significant predictors of episodic foresight abilities, and cumulative risk exposure moderated the relation between episodic memory and episodic foresight. The current study provides a better understanding of

* Corresponding author.
E-mail address: up201802263@edu.fpce.up.pt (S. Salomão).

https://doi.org/10.1016/j.jecp.2024.105985

the influences of multiple adversities on CPS-involved children's episodic foresight abilities and related cognitive outcomes.

Introduction

Children and families engaged with Child Protective Services (CPS) are often exposed to multiple and sometimes cumulative risks at family, community, and social levels (Sameroff & Seifer, 2021). Risk factors are defined as individual and environmental indicators associated with the increased likelihood of detrimental developmental outcomes (Evans et al., 2013). In a multifactorial risk model, the combination of several adversities and risk indicators is regularly used as a measure of cumulative risk in an attempt to achieve greater predictive power concerning child and family outcomes (Appleyard et al., 2005). Such a perspective takes into account singular risk factors described in previous studies to estimate a cumulative risk index (CRI), encompassing individual factors such as children's exposure to maltreatment, abuse, or neglect, parents' low education and cognitive levels, and factors observed at family and social levels such as single-parent families, partner violence, financial strain, prior CPS engagement, and children's out-of-home placement (Atkinson et al., 2015; Malvaso et al., 2020; Roos et al., 2016). The predictive value of the individual and environmental variables for children's cognitive outcomes is enhanced by the combination of multiple risk factors that can be cumulative (Evans et al., 2013; Solomon et al., 2016).

Evidence has shown the short- and long-term detrimental effects of risks and adversities on children's cognitive development (Cowell et al., 2015; Irigaray et al., 2013; Roos et al., 2016; Valentino et al., 2009). These effects include episodic memory and executive functioning impairments in children exposed to risk and adversities (Bücker et al., 2012; DePrince et al., 2009; Goodman et al., 2010; Johnson et al., 2005; Kirke-Smith et al., 2014; Salomão et al., 2021).

Compared with the extensive research on the effects of risks and adverse experiences on memory and executive functions, little is known about the consequences for children's prospective abilities. These regard children's future thinking and their capacity to imagine and anticipate future events, simulate upcoming personal experiences, and reorient their current actions envisioning future needs in maltreatment and adverse circumstances. Context variables such as socioeconomic status and family environment have been related to the development of episodic foresight in preschoolers, with poverty and deprivation being associated with lower episodic foresight abilities (Vásquez-Echeverría et al., 2019). In addition, research suggests that adolescents with a history of child maltreatment present lower performance on episodic foresight than non-maltreated adolescents (Gerin, 2018).

CPS-involved children are often exposed to unstable home environments and inconsistent caregiving (Font & Berger, 2015; Gerin, 2018; Solomon et al., 2016). The adversities they face are also associated with unpredictable environments that might hinder the development of children's future thinking and future-oriented abilities, that is, the capacity to adjust their responses, momentarily disengaging from the immediate situation, to envisage new functional and flexible strategies adapted to different plausible future scenarios.

Enriching environments and nurturing relationships with the parents in everyday life play an important role in the scaffolding of children's future thinking skills (Shin et al., 2020). On the contrary, a dysfunctional environment, the lack of organization and routines, instability, and inconsistencies often observed within CPS-involved families may hinder the development of children's prospective cognitive abilities. Research on the detrimental effects of risk exposure throughout the development of episodic foresight is still scarce, particularly in the case of CPS-involved school-aged children.

The development of episodic foresight

There has been increasing interest in the study of episodic foresight as a milestone in child developmental processes. Episodic foresight is defined as the mental projection of oneself into predicted future scenarios in order to mentally pre-experience some specific event and to act in the present, taking into account this anticipation of upcoming episodes. It regards the ability to create a mental representation of future events entailing a self-projection of how one might feel, think, and deal with plausible future scenarios. Episodic foresight encompasses future thinking abilities (e.g., anticipation, simulation, prospection, imagination) and is involved in future-oriented behaviors (e.g., planning, delay of gratification, problem-solving) (Atance et al., 2023; Atance & O'Neill, 2001; Loose & Vasquez-Echeverria, 2021). Episodic foresight not only is crucial in individual cognitive development but also represents an adaptive advantage. This is apparently a human-specific feature given the enhanced skills required to anticipate future needs, adjusting current responses to fit upcoming environmental pressures (Suddendorf, 2017).

In developmental processes, the emergence of rudimentary forms of episodic foresight is first observed at 3 years of age, with significant improvement during the preschool years (Atance & Meltzoff, 2005). However, preschool children still underperform school-aged children in tasks where they are supposed to reason about an upcoming event considering future needs (Mahy, 2016). Previous studies have shown that episodic foresight abilities significantly progress during middle childhood, and protracted changes are observed during adolescence (Abram et al., 2014; Adornetti et al., 2021; Coughlin et al., 2014, 2019; Ferretti et al., 2018; Terrett et al., 2019). The work by Ferretti et al. (2018) evaluated the developmental trajectory of episodic foresight among 6- to 11-year-olds using the behavioral forced-choice task developed by Atance and Meltzoff (2005). Participants were children with average school performance, normal cognitive and learning development, and no history of psychiatric or neurological disorders. Episodic foresight outcomes were compared across three age groups (6 to 7.10 years, 8 to 9.08 years, and 10 to 11.06 years), with the 6- and 7-year-olds' underperforming their older peers.

Episodic foresight, episodic memory, and executive functions

Research has shown that school-aged children improve their capacity to imagine the future by means of recombining elements retrieved from past experiences (Coughlin et al., 2014; Terrett et al., 2019). There are common developmental trajectories for the cognitive and neural processes underlying the abilities to remember the past and imagine the future (Nyhout & Mahy, 2023; Szpunar & Schacter, 2018). The constructive episodic simulation hypothesis suggests that the ability to produce episodic content in the recollection of past personal experiences (i.e., episodic memory system) supports the capacity for future simulation through the flexible retrieval and recombination of elements depicted from past experiences and applied in the representations of plausible future events (Schacter & Addis, 2007). Episodic memory is part of the declarative (explicit) memory system and regards the ability to recall some event or information embedded in the particular context where it was originally encoded as a personal experience (Tulving, 2005). In other words, episodic memory is the representation of personal events within their single spatiotemporal context where information was obtained firsthand, shaped by personal experience along with contextual details, leading to a self-conscious mental re-experience of the past event (Renoult et al., 2019). In developmental processes, the emergence of episodic memory abilities precedes and scaffolds the development of episodic foresight (Coughlin et al., 2014; Suddendorf, 2017). From a certain point in children's development, episodic mental representations of both past and future events are observed with a strong association (Abram et al., 2014; Nyhout & Mahy, 2023; Szpunar & Schacter, 2018). Adverse experiences and risk exposure are likely to hinder the development of episodic memory and foresight abilities by jeopardizing the scaffolding process.

Episodic foresight abilities require several functions related to executive control; that is, children need to keep track and remember the task rules, refrain from immediate responses related to current states of mind and current needs, and reorient their thinking and actions toward simulated possible future needs. However, further research is necessary given that controversies abound concerning

which specific executive functions are more relevant for episodic foresight abilities (Loose & Vasquez Echeverria, 2021; Schacter et al., 2017; Ünal & Hohenberger, 2017).

Executive functions comprise a set of basic cognitive processes (i.e., inhibitory control, working memory, and cognitive flexibility) as well as higher-order functions related to reasoning and planning that convey the voluntary and effortful control of thoughts, actions, and emotions during goal-directed tasks. Inhibitory control comprises the ability to suppress thoughts and actions that interfere with the achievement of goals, refraining from the tendency for automatic responses (Aydmune et al., 2019). Working memory allows the person to hold information in mind and to manipulate it efficiently during a goal-oriented task (Friedman & Miyake, 2017). Cognitive flexibility regards the ability to switch between tasks or actions to adjust the performance to new demands regarding complex situations, rules, or goals or different sources of stimulation (Chevalier, 2015). Further research has also addressed the relation between executive functions and episodic foresight. In previous studies with normative samples, executive functions were not associated with episodic foresight, with the exception being the outcome measured by the Picture Book Trip task (Atance and Meltzoff, 2005), which presented positive correlations with inhibitory control, working memory, and cognitive flexibility (Hanson et al., 2014; Ünal & Hohenberger, 2017). Other studies found working memory to be positively associated with episodic foresight (Adornetti et al., 2021; Cheie et al., 2021; Ferretti et al., 2018; Horner et al., 2023).

The current study

The complex cognitive functions and mechanisms underlying episodic foresight abilities are still not fully explained, and further research on these is warranted, especially within children exposed to risks and adversities (Cheie et al., 2021; Horner et al., 2023; Miloyan & McFarlane, 2019; Ünal & Hohenberger, 2017). Despite the associations between episodic memory and episodic foresight being well-established in studies with typically developing children, in line with the constructive episodic simulation hypothesis (Nyhout & Mahy, 2023; Renoult et al., 2019; Schacter & Addis, 2007; Schacter et al., 2017; Szpunar & Schacter, 2018), little is known about how this association works with children undergoing adversity.

In addition, although several studies have demonstrated the impact of adversity on children's cognitive outcomes, few have addressed the possible detrimental effects of risk exposure on the development of prospective abilities. Our study is a first attempt to address this literature gap by characterizing the episodic foresight abilities of school-aged Portuguese children engaged with the CPS and describing its association with other cognitive functions and how this association is affected by the cumulative exposure to risk and adversity factors. Specifically, the study (a) describes the episodic foresight performance in a sample of Portuguese CPS-involved school-aged children and its associations with children's age and sex, episodic memory, executive functions (inhibitory control, working memory, and cognitive flexibility), and cumulative risk index (CRI); (b) compares the episodic foresight outcomes of CPS-involved children undergoing multiple risks with the results reported by Ferretti et al. (2018) using an approximate normative sample of children not exposed to risks or adversities; (c) evaluates the effect of age, CRI, episodic memory, and executive functions as predictors of episodic foresight abilities; and (d) analyzes the role CRI plays in the association between episodic memory and episodic foresight.

The current study raised the question of whether, in CPS-involved children who are exposed to multiple risks and adversities, the development of episodic foresight abilities is hindered and how it relates to episodic memory and executive functioning. According to the constructive episodic simulation hypothesis, we expected to find a positive association between episodic memory and episodic foresight. In addition, we hypothesized that in the presence of cumulative risk factors, both children's episodic memory and their foresight abilities are hindered and that having high levels of episodic memory prevents the detrimental effects of cumulative risk exposure on episodic foresight.

Method

Participants and data collection

The current study included 95 Portuguese children (61 boys, 64.21%) aged 6 to 13 years (M = 9.66 years, SD = 1.82) enrolled in elementary and middle school (Grades 1–7). Children's cognitive performance was below expected for the age group norms, considering the mean scaled scores of nonverbal intelligence and verbal comprehension, as presented in Table 1.

Children were recruited from families engaged with the CPS and referred to parenting support services in community-based settings. The main reasons for referral (which could overlap) included suspicion of neglect (n = 32, 36.69%), children's disruptive behaviors (n = 30, 31.58%), exposure to domestic violence (n = 28, 29.47%), and suspicion of child abuse and maltreatment (n = 5, 5.26%).

Of the 95 participants, 43 were from single-parent families (45.26%), 18 lived with both parents (18.95%), and 20 with reconstituted families (21.05%). Of the participants' families, 46 were considered as large-size families with three or more children under 18 years of age (48.42%). In addition, 87 families were dependent on government assistance (91.58%), and 53 parents were unemployed (55.79%). Most of the parents had 9 or fewer years of education (n = 79, 83.16%). Finally, 46 families had previous referrals to CPS (48.42%), and 20% had a history of children's out-of-home placement (n = 19).

The parents provided written informed consent to take part in the current study for them and their children. Children's assent regarding their participation was also obtained.

Measures and instruments

Episodic foresight

Children's ability to mentally project themselves into the future, anticipating upcoming needs and states of mind such as hunger, cold, and thirst, was assessed with a forced-choice task called the Picture Book Trip task. This was originally designed by Atance and Meltzoff (2005) for preschoolers and has been used, with adaptations, in other studies for school-aged children with typical development. This task minimizes the linguistic demands and was considered a reliable measure of episodic foresight during middle childhood (Adornetti et al., 2021; Ferretti et al., 2018).

The version of the task employed in the current study included 10 pictures of scenarios, each one followed by images of three items: one item that addressed a physiological state or need related to the presented scenario; one distractor item, and one semantically related distractor item. Table 2 presents the scenarios and the related items previously used and validated in other studies with adapted versions of the Picture Book Trip task (Adornetti et al., 2021; Vásquez-Echeverría et al., 2019). The scenario pictures are presented one at a time, and after asserting agreement with the experimenter about the comprehension and description of the scenario, children are asked to imagine themselves traveling to that scenario at a future point in time. Afterward, the items are presented and children

Table 1
Participants' cognitive performance: Means (and standard deviations).

Measure	M (SD)	n
Nonverbal intelligence[a]	37.25 (25.97)	
Performance below expected	22.06 (14.29)	63
Performance as expected or above	67.16 (15.63)	32
Verbal comprehension level[b]	8.00 (3.65)	
Performance below expected	6.22 (2.35)	67
Performance as expected or above	12.41 (2.29)	27

[a] Measure obtained with Raven's Colored Progressive Matrices (Raven et al., 1998).
[b] Measure obtained with the vocabulary subtest of the Wechsler Intelligence Scale for Children–Third Edition (Wechsler, 2003).

Table 2
Scenarios, items, and examples of answers evaluated as appropriate and inappropriate in the explanation given for the item choice in the Picture Book Trip task[a] applied to measure children's episodic foresight ability.

Scenario	Correct item	Distractor item	Semantically related item	Example of appropriate answer	Example of inappropriate answer
Sunny desert	sunglasses	soap	shells	"So the sun can't burn my eyes".	"In the desert the sun is bright".
Rocky stream	bandages	pillow	fish	"In the case I fall and get hurt, this could protect me".	"For protection . . ."
Long road	water	shampoo	plant	"I might be thirsty".	"Keeping ourselves hydrated is very important".
Mountains	lunch	bowl	kindling	"I am going to get hungry".	"We need to eat".
Waterfall	raincoat	money	rocks	"If we go under the water, we don't get wet".	"The raincoat protects you from the water".
Snowy landscape	coat	bathing suit	ice cubes	"I/We will be cold".	"It will very be cold".
Rocky mountains	bandages	book	rocks	"In the case I get hurt on the rocks".	"Those rocks are so sharp . . . they hurt you".
Dense forest	insect repellent	necktie	hare	"When the mosquitos come to bite me, I'll be prepared".	"To keep the insects away".
Snowy city street	gloves	guitar	snowman	"To warm my/our hands".	"To warm onés hands".
Cloudy road	raincoat	gift	traffic cones	"Maybe . . . if it rains, I won't get all soaked".	"If it starts raining . . ."

[a] Adapted version of the task originally developed by Atance and Meltzoff (2005).

are asked to choose one item they consider necessary for that trip ("Which of the objects portrayed in these pictures will you need to take with you in this trip?") and to justify their option ("Why will you need this in your trip?").

The scoring system includes a nonverbal measure concerning children's behavioral choice of the appropriate item (with 1 point assigned to each target item correctly chosen—Identification Score, from 1 to 10 points) and a verbal measure related to the explanation presented to justify the choice (with 1 point attributed to each appropriate explanation to justify the choice—Motivation Score, from 1 to 10 points). In this case, the answer was assigned with 1 point in the presence of two elements: (a) a potential future need related to an appropriate state of the self or to internal feelings adjusted to the scenario (e.g., *hungry, thirsty, hurt, cold, wet, burned*) and (b) a semantic formulation with future value (e.g., *going to/gonna, will, could, would, can, when, might, maybe, in case, if*).[1]

A Kuder–Richardson-20 (KR-20) analysis revealed an adequate internal consistency ($\alpha = .79$) for the adapted version of the Picture Book Trip task applied in the current study. For the comparison of CPS-involved children's performance with the reference outcomes obtained by Ferretti and colleagues (2018) regarding a normative sample, we used only four items/scenarios (sunny desert, rocky stream, mountains, and waterfall) of the Picture Book Trip task (Atance & Meltzoff, 2005). The internal consistency of the four-item task version, evaluated with a KR-20 analysis, was reasonable ($\alpha = .68$). One fifth (20%) of the Picture Book Trip task protocols were also analyzed by the third author to establish the interrater agreement. The interclass correlation coefficient for the Episodic Foresight Motivation Score was .995, ranging from .985 to .998, and for the Episodic Foresight Total Score was .999, ranging from .997 to .999.

Episodic memory

Episodic memory ability, the recall of specific personal events, was evaluated with the adapted version of the Episodic Thinking Interview (Coughlin et al., 2014) and the scoring system used in previous studies proposed by Piolino et al. (2007), originally developed by Baddeley and Wilson (1986). The instrument was also applied in a previous study of Portuguese children's narrative and episodic memory abilities (Salomão et al., 2021). Participants were asked to report specific events of their typical routine as well as the interaction with their parents in different situations that were used as cues to evoke the episodic recall. Children were asked to report personal real past events, with as many details as possible, regarding three specific situations when (a) they did something pleasant together with their parents, (b) they misbehaved and their parents reacted to that, and (c) they behaved well or did something very good and their parents responded to that.

Episodic memory scores ranged from 1 to 5 regarding the episodic nature and specificity of the reported event (single or repeated), the spatial and temporal information presented to describe the specific or general circumstances of the event, and the presence (or absence) of phenomenological details used to describe how the participants felt, what they thought, their impressions, and other images associated with the event recall. A score of 1 was attributed in case of absence of response, when participants failed to report an event or reported general information only (e.g., "We just saw a movie together, that's all!"). A score of 2 was attributed to responses that entailed a vague event, with no contextual details, regarding time, space, or specific event circumstances (e.g., "I did something bad... fighting with my classmates and got grounded."). A score of 3 was given when participants reported a generic event, a repeated or continuous event, minimally situated in time and/or space (e.g., "We always take the bus to school in the morning, and we stop at the coffee shop... so mom bought me a cake... I always bring a cake to school when I behave well."). A score of 4 was attributed to a report of a specific event (isolated and situated in time and/or space) without any phenomenological detail (e.g., "Yesterday, I left school and I went with my friends to the park, but I didn't ask my mom before... so then I was grounded when I came home later that day."). Finally, a score of 5 was given for a specific event (isolated and situated in time and/or space) with additional phenomenological details (images, emotions, or thoughts associated to the recalled event) (e.g., "Last

[1] In Portuguese, some sentences have "future value" or represent a semantic reference for future actions, depending on the sense of the speech, even if the verb is presented in the present tense (e.g., "Amanhã vou à escola" [I go to school tomorrow]).

week, I had the best grade in class on the English exam, I told my mom and she was really proud. . . she hanged the test on the kitchen wall, so everyone could see. . . she was really happy and proud of me!").

Each of the three recalls observed during the interview was analyzed independently, and a composite total Episodic Memory Score was obtained with the mean of the singular scores (ranging from 1 to 5). Cohen's kappa was used to estimate inter-coder reliability of the episodic memory scoring system, with 20% of the interviews, randomly selected, also rated by the third author. Cohen's kappa was .87, .82, and .92 for each episodic memory singular score, with 86% of agreement accepted as substantial agreement (Landis & Koch, 1977).

Executive functions

We used two established executive function tasks to evaluate working memory, inhibitory control, and cognitive flexibility among school-aged children. Working memory was assessed by the forward and backward digit span task from the Wechsler Intelligence Scale for Children–Third Edition (WISC-III; Wechsler, 2003), validated for the Portuguese sample. In this task, children are asked to repeat a list of digits, first in the same order presented by the experimenter and then in the reverse order of their presentation. In each trial (forward and backward), the final score (from 0 to 30 points) represents the number of series repeated correctly, according to the instructions. A scaled score was attributed according to the WISC-III manual (Wechsler, 2003).

Inhibitory control and cognitive flexibility were evaluated through the NEPSY-II Inhibition subtest (Korkman et al., 2007), in which two series of 40 black and white figures (the first with circle/ square shapes, and the second with up/ down-oriented arrows), each one randomly distributed in five rows, are separately presented to participants who are tested in three different conditions (naming, inhibition, and switching). In the naming condition, children are asked to correctly name, in order and as quickly as possible, the shapes (circle or square, in the first serie), and the direction of the arrow (up or down, in the second serie), regardless of their color. Next, in the inhibition condition, children are asked to provide the opposite answer, saying "square" when they see a circle and saying "circle" when they see a square (or saying "up" when they see a down-oriented arrow and saying "down" when they see an up-oriented arrow). This condition provides the performance of children's inhibitory control, the ability to suppress an automatic response and display a less dominant response instead. Afterward, in the switching condition, children are asked to apply contrasting rules and respond to the stimuli considering the color of the figure. Black figures are supposed to generate responses according to the naming condition instructions, and white figures are supposed to generate responses according to the inhibition condition instructions. Hence, the switching condition increases the complexity of the task and is taken as a measure of cognitive flexibility, the ability to switch between different response frameworks or demands.

After the practice stage for each trial, children are asked to answer to the three conditions as quickly as they can and to avoid making mistakes. The performance of children is timed by the experimenter, and the uncorrected and self-corrected items are assigned to calculate the Total Errors and Total Completion Time Scores, distributed in percentiles and scaled scores. Combined Scaled Scores are computed, integrating the number of Total Errors and the Total Completion Time, in each condition, ranging from 1 to 20 points. The higher the children's achievement on the scale, the better their inhibitory control and cognitive flexibility abilities. Previous works used the NEPSY-II Inhibition subtest with similar sample characteristics regarding age, language, and cultural background (Bayanova et al., 2022; Magalhães et al., 2020).

Sociodemographic data and cumulative risk index

Information about the family, the reasons for referral, the circumstances of vulnerability, the family support, and the protective measures applied was provided by the CPS professionals and the parents' self-report in the sociodemographic questionnaire prepared for the study.

Following the additive model of multiple risk factors (Appleyard et al., 2005; Evans et al., 2013), the CRI was calculated by the total sum of 11 risk factors observed for each participant. The 11 risk factors were defined and selected according to prior literature describing the individual (or combined) effect they have on child development and on cognitive outcomes (DePrince et al., 2009; Malvaso et al., 2020; Perkins & Graham-Bermann, 2012; Roos et al., 2016). Table 3 presents the definitions of the

Table 3
Cumulative risk index variables and description of the risk exposure.

Risk variables	No risk exposure (0)	Risk exposure (1)	*n* (%) families with risk
Individual risk characteristics			
Caregiver's matrix reasoning[a]	≥10	<10	55 (57.89%)
Caregiver's educational level	≥9 years of education	<9 years of education	54 (56.84%)
Family risk characteristics			
Single-parent family	Two-parent family	Single-parent family	43 (45.26%)
Large family size	0–2 children	3 or more children	46 (48.42%)
Families in need of government assistance	No need of assistance	In need of assistance	87 (91.57%)
Caregiver unemployment	Caregiver employed	Caregiver unemployed	53 (55.79%)
Previous referrals to Child Protective Services	No previous referrals	One or more previous referrals	46 (48.42%)
Referral for exposure to domestic violence	No occurrence of referral for domestic violence	Occurrence of referral for domestic violence	33 (35.79%)
Referral for suspect of neglect	No occurrence of referral for suspect of neglect	Occurrence of referral for suspect of neglect	38 (38.94%)
Referral for suspect of abuse/maltreatment	No occurrence of referral for suspect of abuse/maltreatment	Occurrence of referral for suspect of abuse/maltreatment	6 (6.32%)
Previous out-of-home placement	No occurrence of child out-of-home placement	Occurrence of child out-of-home placement	19 (20%)

[a] Caregiver performance (scaled score) on the matrices subtest of Wechsler Adult Intelligence Scale–Third Edition (Wechsler, 1997, 2008).

11 binary (0 = absent, 1 = present) risk variables observed in different levels and dimensions, including individual and familiar indicators: (a) caregiver cognitive level, (b) caregiver educational level, (c) family structure, (d) family size, (e) financial/government assistance, (f) occupational status, (g) occurrence of previous referrals to CPS, (h) occurrence of referral for suspect of neglect, (i) occurrence of referral for exposure to domestic violence, (j) occurrence of referral for suspect of child abuse or maltreatment, and (k) occurrence of previous out-of-home placement. The CRI ranged from 0 to 11, with a higher score meaning exposure to a greater number of risk factors. The CRI had a normal distribution among the families of participant children, and most of the families (69.5%) presented 4 to 6 risk factors as outcome of the CRI (M = 5.05, SD = 1.63).

Procedure

The current study is part of a research project that received ethical approval from the ethics committee of the Faculty of Psychology and Education Science at the University of Porto (approved on 14/04/2020, ref. 2020/04-2) and received approval from the Data Protection Unit of the University of Porto (approved on 03/08/2019, ref. 2018091915006231). Children were interviewed and completed the cognitive tasks in individual sessions, with a duration ranging from 45 to 60 min. The interviews and cognitive tasks were conducted by a research team member in a quiet, secure, and appropriate environment with no distractors. The facilities were provided by the CPS caseworker in charge of the family support and the application of the protective measures. Children were first accompanied by their parents and then brought to a separate room where the interview and the assessment took place. The interview was audio-recorded and transcribed for further analysis.

Data analytic plan

All analyses were conducted with SPSS Version 29.0 (IBM Corp., 2022). First, we obtained the means and standard deviations for the outcome measures, and we performed Pearson bivariate cor-

relations to describe the associations among episodic foresight abilities, children's age and sex, episodic memory, executive functions, and the CRI.

We then ran one-way analyses of variance (ANOVAs) with episodic foresight scores as the dependent variables and age group as a fixed factor to determine whether participants' episodic foresight abilities varied as a function of age within the sample of CPS-involved school-aged children. Bonferroni post hoc comparison across groups was performed. The age groups were defined according to previous research on typical episodic foresight developmental trajectory in school-aged children by Ferretti et al. (2018), in which the authors compared three age groups matched for nonverbal IQ level and gender across three age groups: 6 to 7.10 years (n = 43; M = 6.48 years, SD = 0.49), 8 to 9.08 years (n = 47; M = 8.58 years, SD = 0.49), and 10 to 11.06 years (n = 47; M = 10.13 years, SD = 0.28). In our work, we divided the sample (N = 95) into three age groups. In the first group (n = 21, 57.14% males) children's ages ranged from 6.11 to 7.99 years (M = 7.29 years, SD = 0.67), in the second group (n = 32, 62.5% males) ages varied from 8.03 to 9.94 years (M = 8.94 years, SD = 0.54), and in the third group (n = 42, 69.04% males) children's age ranged from 10.03 to 13.25 years (M = 11.38 years, SD = 0.91).

We did one-sample t tests to compare the CPS-involved children's episodic foresight abilities in the current study with Ferretti et al.'s (2018) approximate normative reference sample, using their reported outcomes as test values. For this, we used data from a subset of 48 children to match the exact age distribution and demographic characteristics of the study by Ferretti et al. described above.

A multiple regression analysis was performed to test whether children's age, the CRI, and the cognitive variables evaluated in the study significantly predicted the episodic foresight abilities of CPS-involved children. The model was performed using the forced entry method, and the predicting variables were added in two blocks. The first block included children's age, and the second block included the CRI along with the other cognitive variables. The inclusion of such variables is justified by the literature sustaining a relation among episodic foresight ability, episodic memory, and executive functions and also empirically by the results of the Pearson bivariate correlations. For the regression analysis, 20 participants were found to have missing values on executive functions and episodic memory measures given that, during the COVID-19 pandemic, Portugal had multiple mandatory lockdowns where no physical contact was allowed, and the data collection procedure was adapted to an online version and applied through a secure videoconference. As a consequence, it was not possible to collect some measures of the original protocol that were not suitable for the online format.

Finally, taking into consideration the particular characteristics and results previously observed in this at-risk sample, and also the literature on episodic foresight abilities and its manifestation during child development, we did a moderation analysis to examine the role of cumulative risk in the relationship between episodic memory and episodic foresight. The moderating effect was tested, controlling for children's age, using the PROCESS macro for SPSS, Model 1 (Hayes, 2018). The assumptions of the linear model were verified, and the means for the independent variable (episodic memory) and the moderator were centered prior to computing the interaction to ensure that the analysis was not distorted by the correlation between episodic memory and CRI as well as their interaction. The Johnson–Neyman technique was applied to evaluate the range of significance of the interaction and the moderator values for which the interaction effect was significant (Johnson & Neyman, 1936).

Results

Descriptive statistics and association among variables

Table 4 shows the descriptive statistics for the variables in the study and the associations among them. Moderate positive correlations were observed between episodic foresight and episodic memory and between episodic foresight and children's age, as shown in Table 4. The CRI was negatively correlated with episodic foresight. Weak positive correlations were observed between episodic foresight and two executive functions: working memory and cognitive flexibility. Episodic foresight was not significantly correlated with inhibitory control or with children's sex.

Table 4
Means, standard deviations, and bivariate Pearson (*r*) correlations between episodic foresight, executive functions, episodic memory, children's age and sex, and CRI.

Measure	*M*	*SD*	1	2	3	4	5	6	7
1. Episodic foresight	12.8	3.76	–						
2. Inhibitory control	7.68	3.23	.02	–					
3. Cognitive flexibility	7.98	2.86	.22*	.42**	–				
4. Working memory	7.84	3.03	.21*	.26*	.19	–			
5. Episodic memory	2.84	1.25	.48**	.06	.06	.31**	–		
6. Children's age	9.65	1.82	.41**	−.13	−.21	.04	.48**	–	
7. Children's sex[a]	–	–	−.05	.23*	.20	−.01	.02	−.14	–
8. CRI	5.05	1.63	−.25*	−.09	−.03	−.19	−.17	.02	.23

Note. CRI, cumulative risk index.
[a] Boys = 0, girls = 1.
* $p < .05$ (two-tailed).
** $p < .01$ (two-tailed).

Table 5
Performance on the Picture Book Trip task, assessing episodic foresight abilities, comparing three age groups: Means (and standard deviations).

Measure	Total *N* = 95	6- to 7.9-year-olds *n* = 21	8- to 9.9-year-olds *n* = 32	10- to 13-year-olds *n* = 42	Post hoc
Episodic Foresight Composite Score	12.80 (3.77)	9.90 (0.75)	13.09 (0.61)	14.02 (0.53)	1 < 2 = 3*
Identification Score	8.38 (1.92)	6.76 (0.37)	8.41 (0.30)	9.17 (0.26)	1 < 2 = 3*
Motivation Score	4.42 (2.43)	3.14 (0.51)	4.69 (0.42)	4.86 (0.36)	1 < 3 = 2*

* Group-related differences were statistically significant after Bonferroni correction ($p < .05$).

Comparison of episodic foresight abilities across age groups

The Episodic Foresight Composite Scores were found to be different across groups, as given by significant main effect of age revealed in the one-way ANOVA, $F(2, 92) = 10.21$, $p < .001$, $\eta_p^2 = .18$. Bonferroni's post hoc analysis indicated that 6- to 7.9-year-old children exhibited worse episodic foresight abilities when compared with both 8- to 9.9-year-olds and 10- to 13-year-olds. There were no significant differences in the comparison of the performance of the two older age groups, as presented in Table 5. A main effect of age was also observed in the ANOVA of Identification Score, $F(2, 92) = 14.04$, $p < .001$, $\eta_p^2 = .23$, as dependent variables and age group as a fixed factor, with children from the younger group underperforming both groups of older participants. The ANOVA also showed group-related differences on the Motivation Score, $F(2, 92) = 4.03$, $p = .021$, $\eta_p^2 = .08$, and the post hoc analysis indicated that 6- to 7.9-year-olds' performance was not significantly different from that of 8- to 9.9-year-olds, with the superposition of the 95% confidence intervals (CIs) [2.12, 4.16] and [3.86, 5.51], but children from the younger group still underperformed the 10- to 13-year-old children (see Table 5).

In addition, we estimated the episodic foresight abilities using the same four items of the Picture Book Trip task described by Ferretti et al. (2018) and compared the results across the three age groups. This ANOVA resulted in similar outcomes, showing a main effect of age on episodic foresight abilities, $F(2, 92) = 6.66$, $p = .002$, $\eta_p^2 = .13$, with the 6- to 7.9-year-old children ($M = 4.00$, $SD = 0.39$) exhibiting lower scores than the 8- to 9.9-year-olds ($M = 5.34$, $SD = 0.32$) and the 10- to 13-year-olds ($M = 5.74$, $SD = 0.28$).

One-sample *t* test indicated that the CPS-involved children had significantly lower episodic foresight abilities compared with the normative reference sample (Ferretti et al., 2018) at the test value of 6.33 for 6- and 7-year-old children ($M = 3.63$, $SD = 0.73$), $t(7) = -3.70$, $p = .008$, $d = 1.31$; at the

test value of 7.38 for 8- and 9-year-olds (M = 5.14, SD = 0.41), $t(20) = -5.46$, $p < .001$, $d = 1.19$; and at the test value of 7.49 for 10- and 11-year-olds (M = 5.21, SD = 0.39), $t(18) = -5.78$, $p < .001$, $d = 1.33$.

Regression and moderation analysis

To analyze children's age, CRI, episodic memory, and executive functions as predictors of episodic foresight abilities in this CPS-involved sample, a multiple regression analysis was performed with the Episodic Foresight Composite Score as dependent variable. Children's age, as the only variable included in the first block, explained 9% of the variance and was a significant predictor of episodic foresight, $R^2 = .10$, $F(1, 73) = 8.09$, $p < .01$. When CRI and the cognitive variables were included in the model, significant variance was added to the model ($\Delta R^2 = .32$, $p < .001$). The final model explained 37% of the variance, $R^2 = .42$, $F(6, 68) = 7.54$, $p < .001$, with CRI negatively predicting episodic foresight, and children's age, cognitive flexibility, and episodic memory positively predicting episodic foresight, as shown in Table 6.

Moderation analyses were performed to evaluate the role of CRI in the well-established relationship described in the literature between episodic memory and episodic foresight while controlling for children's age. The CRI was mean-centered and categorized in three levels—low risk ($M - 1SD$), moderate risk (M), and high risk ($M + 1SD$)—by the statistical software used to run the analysis, specifically the IBM SPSS Process macro (Hayes, 2018). As illustrated in Table 7, both episodic memory and

Table 6
Unstandardized coefficients (and standard errors) of the multiple regression analysis for episodic foresight as dependent variable and children's age, CRI, executive functions, and episodic memory as predictors.

	Model 1	Model 2
β_0 (intercept)	6.44 (2.42)**	5.32 (2.87)
β_1 (children's age)	0.69 (0.24)**	0.49 (0.23)*
β_2 (CRI)		−0.65 (0.21)**
β_3 (working memory)		0.19 (0.12)
β_4 (inhibitory control)		−0.08 (0.12)
β_5 (cognitive flexibility)		0.37 (0.13)**
β_6 (episodic memory)		0.79 (0.32)*
R^2	.10	.42
Adjusted R^2	.09	.37
F	8.09**	7.53***
ΔR^2		.32**

Note. CRI, cumulative risk index.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

Table 7
Regression results for a moderation model evaluating the impact of CRI and EM and their interaction on episodic foresight, controlling for children's age.

	Coefficient (b)	Standard error	t	p
Constant	9.85	2.08	4.74	.000
EM (X)	1.05	0.31	3.41	.001
CRI (W)	−0.58	0.20	−2.83	.006
EM*CRI (X*W)	0.36	0.18	2.00	.05
Children's age (covariate)	0.34	0.21	1.62	.11
Conditional effects (W)				
−1.64 ($M - 1SD$)	0.46	0.42	1.11	.27
.000 (M)	1.05	0.31	3.41	.001
1.64 ($M + 1SD$)	1.64	0.44	3.76	.000

Note. CRI, cumulative risk index; EM, episodic memory.

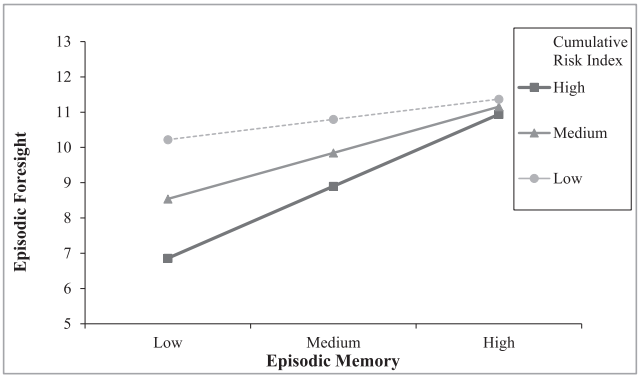

Fig. 1. Association between episodic memory and episodic foresight at low, moderate, and high levels of cumulative risk.

CRI were significant predictors of episodic foresight, revealing positive and negative associations, respectively. The interaction between CRI and episodic memory was also significant, suggesting the moderator role of CRI.

Results indicated that episodic memory and episodic foresight were positively associated at moderate levels (β = 1.05, *SE* = 0.31, p = .001, 95% CI [0.44, 1.66]) and high levels (β = 1.64, *SE* = 0.44, p < .000, 95% CI [0.77, 2.51]) of CRI. However, there was a nonsignificant association between episodic memory and episodic foresight at low levels of CRI (β = 0.46, *SE* = 0.42, p = .27, 95% CI [−0.37, 1.29]).

The simple slope analysis illustrated in Fig. 1 indicates that at low levels of risk the association between episodic memory and episodic foresight was not statistically significant, whereas at moderate and high levels of risk the relationship between episodic memory and episodic foresight became positive and significant (p < .001).

Johnson–Neyman analysis of simple slopes indicated that the region of significant moderation was observed from the CRI value of − 1.00 onward (in *z* scores).

In absolute values, this means that above five risk factors, among those used to estimate the CRI, the moderator strengthened the positive relation between episodic memory and episodic foresight.

Discussion

The capacity to represent the future, to project oneself into plausible upcoming scenarios adjusting one's actions and decisions in regard of the future, is a crucial cognitive resource from both an evolutionary and a developmental perspective (Atance et al., 2023; Suddendorf, 2017). The current study set out to characterize episodic foresight abilities in school-aged children engaged with the CPS, addressing its association with episodic memory and executive functions, and how this association is affected by the cumulative exposure to risk factors. It also aimed to describe possible detrimental effects of risk exposure indicated through the comparison of the outcomes observed within CPS-involved children undergoing multiple risks with an approximate normative sample of children not exposed to risks or adversities, as reported by Ferretti et al. (2018).

The development of episodic foresight has gained attention during recent years. Research has shown the enhancement of episodic foresight abilities during middle childhood (Adornetti et al., 2021; Atance et al., 2023; Coughlin et al., 2019; Terrett et al., 2019). Although there are no standardized measures or parameters to evaluate episodic foresight abilities regarding children's age and developmental level, our findings are consistent with those of previous studies suggesting that episodic foresight ability increments are observed in school-aged children (Abram et al., 2014; Coughlin et al., 2014).

The comparison of the episodic foresight abilities observed in the current study with the results reported by a study of episodic foresight developmental trajectory in school-aged children with

typical development and not exposed to risks or adversities (Ferretti et al., 2018) indicated that CPS-involved children had diminished performance, with significantly lower episodic foresight scores. In addition, the evidence that CRI negatively predicts episodic foresight abilities also confirms the hypothesis of the detrimental effect of cumulative risk exposure on the episodic foresight abilities of CPS-involved school-aged children, which is in line with the study of Gerin (2018) showing the detrimental effect of risks and adversities on episodic foresight among adolescents.

The regression analysis of executive functions as predictors of episodic foresight abilities showed that cognitive flexibility was a significant positive predictor, but not working memory or inhibitory control. These findings mirror the evidence provided by previous studies showing that some executive functions may be core cognitive mechanisms underlying episodic foresight abilities (Ferretti et al., 2018; Hanson et al., 2014; Schacter et al., 2017). Our findings corroborate previous studies suggesting that episodic foresight comprises flexibility to deal with diverse alternative scenarios and to shift between current and future constraints, which might not always be consistent with the current experience (Miloyan & McFarlane, 2019).

Another important finding was the role of episodic memory as a predictor of episodic foresight abilities, expressed through a positive medium effect size association. This is in line with the evidence reported by previous studies (Coughlin et al., 2014, 2019; Renoult et al., 2019; Szpunar & Schacter, 2018; Terrett et al., 2019). In accordance with the constructive episodic simulation hypothesis (Schacter & Addis, 2007), our findings illustrate a close relation between the mental representations of the past and the representations of the future, allowing one to mentally re-enact a specific personal past experience and to imagine upcoming events, projecting the self forward in time in order to mentally anticipate the future (Nyhout & Mahy, 2023; Tulving, 2005).

Future projection involved in episodic foresight abilities relies heavily on episodic memory, which is crucial to scaffold the emergence and progress of episodic foresight abilities in developmental processes (Coughlin et al., 2014; Nyhout & Mahy, 2023; Tulving, 2005). In the current study, the association between episodic memory and episodic foresight was disclosed in moderate and high levels of cumulative risk, but not in low levels. The episodic foresight performance among children exposed to low levels of risk seems to be preserved from the detrimental effects of risks (which are more evident in moderate and high levels of CRI) and appears to be closer to that of children with typical development not exposed to risks or adversities. The incremental performance in these circumstances indicates that children achieve the highest levels of episodic foresight abilities during middle and late childhood, preceding the protracted changes observed during adolescence (Adornetti et al., 2021; Coughlin et al., 2014, 2019; Ferretti et al., 2018; Gerin, 2018; Terrett et al., 2019). Within this framework, our findings indicate the stability of the episodic foresight abilities among children exposed to low levels of risk. Greater stability of episodic foresight abilities also means less variability in the developmental outcomes, noting that episodic foresight becomes less dependent on the episodic memory scaffolding processes. The literature acknowledges that the mechanisms underlying episodic foresight are not fully explained, and as such further research is required to deepen our understanding of which and how cognitive functions work as underlying mechanisms to explain episodic foresight abilities, especially those related to self-regulatory processes and more sophisticated future thinking orientation (Ferretti et al., 2018; Loose & Vasquez Echeverria, 2021).

Confirming our hypothesis, the results provide additional evidence pointing to the detrimental effects of cumulative risk on episodic foresight abilities and its relation to episodic memory. High and medium levels of CRI strengthened the positive association between episodic memory and episodic foresight when compared with low levels of CRI. Furthermore, our findings suggest that higher levels of episodic memory in CPS-involved children might buffer the detrimental effect of risk on episodic foresight abilities. CPS-involved children who manage to recall specific events and talk about their personal past experiences, presenting preserved episodic memory abilities even when exposed to moderate or high levels of risk, may be more likely to successfully project themselves into the future, imagine upcoming events, and provide adaptive responses to adverse circumstances. In other words, strong episodic memory may protect episodic foresight abilities from the detrimental effects of cumulative risk.

Previous studies demonstrated the detrimental effect of risk exposure and adversities in children's cognitive development, especially in the domains of executive functions (DePrince et al., 2009;

Irigaray et al., 2013; Kirke-Smith et al., 2014) and episodic memory (Goodman et al., 2010; Johnson et al., 2005; Salomão et al., 2021; Valentino et al., 2009). The current study contributes to the literature by ascertaining the detrimental effect of cumulative risk exposure on episodic foresight abilities in CPS-involved children. CRI not only was identified as a negative predictor of episodic foresight abilities but also had a moderator effect in the relation between episodic memory and episodic foresight.

One of the key strengths of the current study is the combination of children's self-report measures with cognitive outcomes obtained directly from the children within a multi-method approach, including narrative analysis, a behavior forced-choice task, and standardized and nonstandardized tasks. Different from other studies that applied exclusively narrative assessments of episodic foresight and episodic memory abilities (Abram et al., 2014; Coughlin et al., 2014, 2019; Terrett et al., 2019), we combined behavioral and narrative tasks previously used in other studies in this field.

The current study also presents limitations. Even though it was important to approach the particular sample of CPS-involved children, we acknowledge that the children's behavioral and emotional adjustment might interfere with their cognitive abilities' outcomes and therefore suggest that these outcomes be accounted for in future research addressing CPS-involved children's episodic foresight abilities. This is particularly relevant in the case of the measure of episodic memory that was obtained through the narratives of children's routine and interaction with their parents in everyday life. Given the well-known fact that CPS-involved children may avoid or show some resistance to talk about personal experiences, the children's narratives might present some biases, precluding an accurate evaluation of their cognitive/episodic memory abilities.

The current study is also limited by the lack of a control group to establish a comparison with children not engaged with the CPS and under no influence of risks or adversities. We tried to address this limitation by comparing our data with those of a study using a normative sample of school-aged children (Ferretti et al., 2018). Still, future studies are in order to replicate these analyses with larger samples, including participants not involved with the CPS and not at risk for comparison purposes.

Conclusions

The current study offers some important insights into the literature on episodic foresight during middle childhood, with a focus on CPS-involved children undergoing adversities and cumulative risk exposure. The past decade has seen rapid progress in research on episodic foresight abilities within developmental approaches. The findings presented in the current study offer a contribution to exploring the detrimental effects of risks and adversities on the cognitive domain of mental time representation and future-oriented thinking.

Relevant implications draw attention to the importance of fostering activities in diverse settings (e.g., home, school, CPS) aiming at stimulating episodic memory in children who are exposed to risks and adversities. With this, children's episodic foresight abilities are promoted, which is known to be so important for their well-adjusted functioning. Considering the complex and challenging endeavor of supporting children exposed to risks and adversities, the policy and service planning could benefit from strategies focusing on aspects of children's life that are amenable to change. This may be achieved by promoting children's participation in the settings they attend. By enhancing children's opportunities to talk about their past personal experiences, their episodic memory strengthens, consequently scaffolding episodic foresight abilities.

CRediT authorship contribution statement

Sanmya Salomão: Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Investigation. **Ana Catarina Canário:** Writing – review & editing, Visualization, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Orlanda Cruz:** Writing – review & editing, Visualization, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization.

Data availability

The data that support the findings of this study are openly available in the Open Science Framework at http://osf.io/zhdac, with DOI: 10.17605/OSF.IO/ZHDAC

Acknowledgments

A.C.C. was supported by the Portuguese Foundation for Science and Technology (FCT) under an Institutional Stimulus for Scientific Employment agreement (CEECINST/00134/2021/CP2786/CT0001; https://doi.org/10.54499/CEECINST/00134/2021/CP2786/CT0001). A.C.C. and O.C. were further supported by a grant from the FCT (2022.04975.PTDC; https://doi.org/10.54499/2022.04975.PTDC) and national FCT funds sponsoring the Center for Psychology at the University of Porto (UIDB/00050/2020).

References

Abram, M., Picard, L., Navarro, B., & Piolino, P. (2014). Mechanisms of remembering the past and imagining the future: New data from autobiographical memory tasks in a lifespan approach. *Consciousness and Cognition, 29*, 76–89. https://doi.org/10.1016/j.concog.2014.07.011.

Adornetti, I., Chiera, A., Altavilla, D., Deriu, V., Marini, A., Valeri, G., Magni, R., & Ferretti, F. (2021). Self-projection in middle childhood: A study on the relationship between theory of mind and episodic future thinking. *Cognitive Processing, 22*, 321–332. https://doi.org/10.1007/s10339-021-01013-w.

Appleyard, K., Egeland, B., van Dulmen, H. M., & Strofe, L. A. (2005). When more is not better: The role of cumulative risk in child behavior outcomes. *Journal of Child Psychology and Psychiatry, 46*(3), 235–245. https://doi.org/10.1111/j.1469-7610.2004.00351.x.

Atance, C. M., Ayson, G., & Martin-Ordas, G. (2023). Moving beyond "Spoon" tasks: When do children autocue their episodic future thought? *Cognitive Science, 14*(4)e1646. https://doi.org/10.1002/wcs.1646.

Atance, C. M., & Meltzoff, A. N. (2005). My future self: Young children's ability to anticipate and explain future states. *Cognitive Development, 20*, 341–361. https://doi.org/10.1016/j.cogdev.2005.05.001.

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.

Atkinson, L., Beitchman, J., Gonzalez, A., Young, A., Wilson, B., Escobar, M., Chisholm, V., Brownlie, E., Khoury, J. E., Ludmer, J., & Villani, V. (2015). Cumulative risk, cumulative outcome: A 20-year longitudinal study. *PLoS One, 10*(6)e127650. https://doi.org/10.1371/journal.pone.0127650.

Aydmune, Y., Introzzi, I., & Lipina, S. (2019). Inhibitory processes training for school-age children: Transfer effects. *Developmental Neuropsychology, 44*(7), 513–542. https://doi.org/10.1080/87565641.2019.1677667.

Baddeley, A. D., & Wilson, B. (1986). Amnesia autobiographical memory and confabulation. In D. C. Rubin (Ed.), *Autobiographical memory* (pp. 225–252). Cambridge University Press.

Bayanova, L., Chichinina, E., Veraksa, A., Almazova, O., & Dolgikh, A. (2022). Difference in executive functions development level between two groups: Preschool children who took extra music classes in art schools and children who took only general music and dance classes offered by preschools. *Education Sciences, 12*, 119. https://doi.org/10.3390/educsci12020119.

Bücker, J., Kapczinski, F., Post, R., Ceresér, K. M., Szobot, C., Yatham, L. N., Kapczinski, N. S., & Kauer-Sant'Anna, M. (2012). Cognitive impairment in school-aged children with early trauma. *Comprehensive Psychiatry, 53*(6), 758–764. https://doi.org/10.1016/j.comppsych.2011.12.006.

Cheie, L., Opriș, A. M., & Visu-Petra, L. (2021). Remembering the future: Age-related differences in schoolchildren's prospective memory depend on the cognitive resources employed by the task. *Cognitive Development, 58*, 101048. https://doi.org/10.1016/j.cogdev.2021.101048.

Chevalier, N. (2015). The development of executive function: Toward more optimal coordination of control with age. *Child Development Perspectives, 9*(4), 239–244. https://doi.org/10.1111/cdep.12138.

Coughlin, C., Lyons, K., & Ghetti, S. (2014). Remembering the past to envision the future in middle childhood: Developmental linkages between prospection and episodic memory. *Cognitive Development, 30*, 96–110. https://doi.org/10.1016/j.cogdev.2014.02.001.

Coughlin, C., Robins, R. W., & Ghetti, S. (2019). Development of episodic prospection: Factors underlying improvements in middle and late childhood. *Child Development, 90*(4), 1109–1122. https://doi.org/10.1111/cdev.13001.

Cowell, R. A., Cicchetti, D., Rogosch, F. A., & Toth, S. L. (2015). Childhood maltreatment and its effect on neurocognitive functioning: Timing and chronicity matter. *Development and Psychopathology, 27*(2), 521–533. https://doi.org/10.1017/S0954579415000139.

DePrince, A., Weinzierl, K., & Combs, M. (2009). Executive function performance and trauma exposure in a community sample of children. *Child Abuse & Neglect, 33*(6), 353–361. https://doi.org/10.1016/j.chiabu.2008.08.002.

Evans, G. W., Li, D., & Whipple, S. S. (2013). Cumulative risk and child development. *Psychological Bulletin, 139*(6), 1342–1396. https://doi.org/10.1037/a0031808.

Ferretti, F., Chiera, A., Nicchiarelli, S., Adornetti, I., Magni, R., Vicari, S., Valeri, G., & 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.

Font, S. A., & Berger, L. M. (2015). Child maltreatment and children's developmental trajectories in early to middle childhood. *Child Development, 86*(2), 536–556. https://doi.org/10.1111/cdev.12322.

Friedman, N. P., & Miyake, A. (2017). Unity and diversity of executive functions: Individual differences as a window on cognitive structure. *Cortex, 86*, 186–204. https://doi.org/10.1016/j.cortex.2016.04.023.
Gerin, M. (2018). *A mechanistic investigation of neuro-cognitive and experiential factors associated with psychiatric vulnerability following childhood maltreatment*. Unpublished doctoral dissertation, University College London.
Goodman, G. S., Quas, J. A., & Ogle, C. M. (2010). Child maltreatment and memory. *Annual Review of Psychology, 61*, 325–351. https://doi.org/10.1146/annurev.psych.093008.100403.
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.
Hayes, A. (2018). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach* ((2nd ed.)). Guilford Press.
Horner, K., Coundouris, S. P., Terrett, G., Rendell, P. G., & Henry, J. D. (2023). Self-initiating and applying episodic foresight in middle childhood. *Journal of Experimental Child Psychology, 233*, 105696. https://doi.org/10.1016/j.jecp.2023.105696.
IBM Corp. (2022). *IBM SPSS Statistics for Windows* (Version 29.0).
Irigaray, T. Q., Pacheco, J. B., Grassi-Oliveira, R., Fonseca, R. P., Leite, J. C. D. C., & Kristensen, C. H. (2013). Child maltreatment and later cognitive functioning: A systematic review. *Psicologia: Reflexão e Crítica, 26*(2), 376–387. https://doi.org/10.1590/S0102-79722013000200018.
Johnson, P. O., & Neyman, J. (1936). Tests of certain linear hypotheses and their application to some educational problems. *Statistical Research Memoirs, 1*, 57–93.
Johnson, R. J., Greenhoot, A. F., Glisky, E., & McCloskey, L. A. (2005). The relations among abuse, depression, and adolescents' autobiographical memory. *Journal of Clinical Child and Adolescent Psychology, 34*(2), 235–247. https://doi.org/10.1207/s15374424jccp3402_3.
Kirke-Smith, M., Henry, L., & Messer, D. (2014). Executive functioning: Developmental consequences on adolescents with histories of maltreatment. *British Journal of Developmental Psychology, 32*(3), 305–319. https://doi.org/10.1111/bjdp.12041.
Korkman, M., Kirk, U., & Kemp, S. (2007). *NEPSY II: Administration manual* ((2nd ed.)). Harcourt Assessment.
Landis, J. R., & Koch, G. G. (1977). An application of hierarchical kappa-type statistics in the assessment of majority agreement among multiple observers. *Biometrics, 33*(2), 363–374. https://doi.org/10.2307/2529786.
Loose, T., & Vasquez-Echeverria, A. (2021). Understanding future thinking among school-age children: A review of studies. *European Journal of Developmental Psychology, 19*(4), 566–584. https://doi.org/10.1080/17405629.2021.1932457.
Magalhães, S., Carneiro, L., Limpo, T., & Filipe, M. (2020). Executive functions predict literacy and mathematics achievements: The unique contribution of cognitive flexibility in Grades 2, 4, and 6. *Child Neuropsychology, 26*(7), 934–952. https://doi.org/10.1080/09297049.2020.1740188.
Mahy, C. E. V. (2016). Young children have difficulty predicting future preferences in the presence of a conflicting physiological state. *Infant and Child Development, 25*(4), 325–338. https://doi.org/10.1002/icd.1930.
Malvaso, C., Pilkington, R., Montgomerie, A., Delfabbro, P., & Lynch, J. (2020). A public health approach to preventing child maltreatment: An intelligent information infrastructure to help us know what works. *Child Abuse & Neglect, 106*, 104466. https://doi.org/10.1016/j.chiabu.2020.104466.
Miloyan, B., & McFarlane, K. A. (2019). The measurement of episodic foresight: A systematic review of assessment instruments. *Cortex, 117*, 351–370. https://doi.org/10.1016/j.cortex.2018.08.018.
Nyhout, A., & Mahy, C. (2023). Episodic thought in development: On the relation between memory and future thinking. *Developmental Review, 70*, 101103. https://doi.org/10.1016/j.dr.2023.101103.
Perkins, S., & Graham-Bermann, S. (2012). Violence exposure and the development of school-related functioning: Mental health, neurocognition, and learning. *Aggression and Violent Behavior, 17*(1), 89–98. https://doi.org/10.1016/j.avb.2011.10.001.
Piolino, P., Hisland, M., Ruffeveille, I., Matuszewski, V., Jambaqué, I., & Eustache, F. (2007). Do school-age children remember or know the personal past? *Consciousness and Cognition, 16*(1), 84–101. https://doi.org/10.1016/j.concog.2005.09.010.
Raven, J., Raven, J. C., & Court, J. H. (1998). *Manual for Raven's Progressive Matrices and Vocabulary Scales*. Oxford Psychologists Press.
Renoult, L., Irish, M., Moscovitch, M., & Rugg, M. D. (2019). From knowing to remembering: The semantic–episodic distinction. *Trends in Cognitive Sciences, 23*(12), 1041–1057. https://doi.org/10.1016/j.tics.2019.09.008.
Roos, L. E., Kim, H. K., Schnabler, S., & Fisher, P. A. (2016). Children's executive function in a CPS-involved sample: Effects of cumulative adversity and specific types of adversity. *Children and Youth Services Review, 71*, 184–190. https://doi.org/10.1111/bjdp.12023.
Salomão, S., Canário, C., & Cruz, O. (2021). Narrative abilities and episodic memory in school-aged children followed by Child Protective Services. *Children, 8*, 849. https://doi.org/10.3390/children8100849.
Sameroff, A. J., & Seifer, R. (2021). Accumulation of environmental risk and child mental health. In B. S. Zuckerman, H. E. Fitzgerald, & B. M. Lester (Eds.), *Children of poverty: research, health, and policy issues* ((2nd ed.,, pp. 233–258). Routledge. https://doi.org/10.4324/9781315861623.
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, 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.
Shin, S. Y., Leech, K. A., & Rowe, M. L. (2020). Examining relations between parent–child narrative talk and children's episodic foresight and theory of mind. *Cognitive Development, 55*, 100910. https://doi.org/10.1016/j.cogdev.2020.100910.
Solomon, D., Asberg, K., Peer, S., & Prince, G. (2016). Cumulative risk hypothesis: Predicting and preventing child maltreatment recidivism. *Child Abuse & Neglect, 58*, 80–90. https://doi.org/10.1016/j.chiabu.2016.06.012.
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.
Szpunar K. K., & Schacter, D. L. (2018). Memory and future imagining. In J. T. Wixted & J. T. Serences (Eds.), *Stevens' handbook of experimental psychology and cognitive neuroscience,* Vol. 1: *Learning and memory* (4th ed., pp. 145–169). John Wiley.

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.

Tulving, E. (2005). Episodic memory and autonoesis: Uniquely human? In H. S. Terrace & J. Metcalfe (Eds.), *The missing link in cognition* (pp. 3–56). Oxford University Press.

Ünal, G., & Hohenberger, A. (2017). The cognitive bases of the development of past and future episodic cognition in preschoolers. *Journal of Experimental Child Psychology, 162*, 242–258. https://doi.org/10.1016/j.jecp.2017.05.014.

Valentino, K., Toth, S. L., & Cicchetti, D. (2009). Autobiographical memory functioning among abused, neglected, and nonmaltreated children: The overgeneral memory effect. *Journal of Child Psychology and Psychiatry, and Allied Disciplines, 50* (8), 1029–1038. https://doi.org/10.1111/j.1469-7610.2009.02072.x.

Vásquez-Echeverría, A., Tomás, C., & Cruz, O. (2019). The development of episodic foresight in preschoolers: The role of socioeconomic status, parental future orientation, and family context. *Psicologia: Reflexão e Crítica, 32*(1), 12–20. https://doi.org/10.1186/s41155-019-0125-4.

Wechsler, D. (2003). *Wechsler Intelligence Scale for Children–Third Edition (WISC-III)—Portuguese version* (M. R. Simões, A. M. Rocha, & C. Ferreira, Trans.). CEGOC.

Wechsler, D. (1997). *Wechsler Adult Intelligence Scale–Third Edition (WAIS-III)*. APA PsycTests.

Wechsler, D. (2008). *Escala de inteligência de Wechsler para adultos – 3a Edição: Instruções para a administração e cotação*. Lisboa: CEGOC-TEA.