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Tele-neuropsychological assessment in children with self-limited epilepsy with centrotemporal spikes: a pilot study

Viola Margheri [a], Simona Pellacani [b,c], Edoardo Fino [b,c], Martina Calì [b,c], Sara Senese [b,c], Costanza Ruffini [a], Carmen Barba [b,c], Renzo Guerrini [b,c], Chiara Pecini [a,*]

[a] Department of Education, Languages, Intercultures, Literature and Psychology (FORLILPSI), University of Florence, Florence, Italy
[b] Neurosciences, Psychology, Drug Research and Child Health (NEUROFARBA), University of Florence, Florence, Italy
[c] Neuroscience and Human Genetics Department, Meyer Children's Hospital IRCCS, Florence, Italy

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ABSTRACT

Introduction: Telemedicine has gained increasing prominence in healthcare services, with neuropsychological tele-assessment emerging as a promising tool for evaluating and monitoring cognitive functions remotely, even in clinical conditions with mild vulnerabilities. Despite its growing application in adults, its use in pediatric clinical contexts remains understudied. Among pediatric disorders, Self-limited epilepsy with centrotemporal spikes (SeLECTs) may feature subtle neuropsychological deficits, particularly in higher order cognitive processes such as Executive Functions (EF), and in learning skills. Early tele-neuropsychological assessment can help delineate the neuropsychological profile in this population.

Method: The feasibility of a fully remote neuropsychological assessment protocol in children with SeLECTs was examined. Forty-seven children (aged 6–13) were recruited, of whom 43 underwent the assessment. Two online sessions via Google Meet and web-based platforms (TeleFE battery), to assess children's cognitive and executive functioning were conducted. Clinicians evaluated the children's engagement and parents completed remote questionnaires addressing academic performances, EF-related behaviors, and feasibility of the procedure.

Results: The protocol demonstrated high feasibility and acceptability, with participants' strong compliance and no major technical issues. Descriptive analyses highlighted the presence of vulnerabilities in executive functioning and school achievement in children with SeLECTs.

Discussion: These findings support the clinical relevance of remote neuropsychological assessment in pediatric epilepsy, offering a scalable and accessible tool to enhance care.

1. Introduction

Telemedicine has gained increasing importance due to pandemic-driven needs and technological advances, leading to widespread neuropsychological tele-assessment via online platforms for evaluating cognitive functions [1]. This approach improves access to services for a broader population, including individuals in remote or disadvantaged areas or facing logistical challenges, by reducing time and physical cost travel. Remote modalities also enable larger and heterogeneous samples, contributing to the generalizability and representativeness of the results, and facilitate repeated administrations, allowing for more longitudinal monitoring and follow-up assessments [1–3].

In adults, recent systematic reviews have shown that neuropsychological assessments via videoconference are characterized by high psychometric quality (e.g., validity, reliability), diagnostic accuracy (e.g., sensitivity, specificity) [4–7], and coherence with in-person evaluations [6], thereby supporting the feasibility of tele-neuropsychological approaches in adulthood.

Despite its growing relevance in adults, tele-assessment in pediatric clinical settings remains limited [3,8]. In children, there are concerns regarding understanding of technology use, privacy, and establishing a therapeutic relationship. Challenges include delivering verbal instructions remotely, and managing children's characteristics, such as attention difficulties and performance anxiety, which may compromise

* Corresponding author at: Via Laura, 48 - 50121 Firenze (FI), Italy.
E-mail addresses: viola.margheri@unifi.it (V. Margheri), simona.pellacani@meyer.it (S. Pellacani), edoardo.fino@meyer.it (E. Fino), martina.cali@meyer.it (M. Calì), sara.senese@meyer.it (S. Senese), costanza.ruffini@unifi.it (C. Ruffini), carmen.barba@meyer.it (C. Barba), renzo.guerrini@meyer.it (R. Guerrini), chiara.pecini@unifi.it (C. Pecini).

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the reliability of the data collected [2,3]. Existing studies generally involved small and poorly characterized samples.

In this context, it is relevant to explore the validity and usability of remote neuropsychological assessment protocols in children, with the aim of enhancing early detection of subtle cognitive and behavioral vulnerabilities. This is especially important in clinical conditions where such difficulties may arise in the absence of global intellectual impairments and exert a possible impact on academic and social achievements.

Executive Functions (EF), higher-order cognitive processes mediated by the neuroanatomical circuits of the prefrontal cortex and its connections, are key predictors of academic achievement, behavioral regulation, and broader aspects of daily functioning [9–10]. According to Diamond's model, EF includes 3 interrelated core abilities: inhibitory control, working memory, and cognitive flexibility [9]. These foundational skills support the development of more complex EF, such as problem-solving and planning. Difficulties in EF can manifest in various clinical and non-clinical contexts and significantly affect a child's academic, social, and behavioral functioning [10]. Early assessment of EF is critical for identifying potential weaknesses and implementing targeted interventions.

One clinical condition in which the presence and nature of executive vulnerability are still actively debated is the Self-limited childhood epilepsy with centrotemporal spikes (SeLECTs). SeLECTs is the most prevalent form of focal pediatric epilepsy, representing 15–20 % of all childhood epilepsies and it typically manifests between the ages of 3 and 14. Seizure frequency is generally low, with most affected children experiencing between 2 and 10 seizures overall, and remission typically occurs in adolescence [11].

SeLECTs was initially considered as devoid of significant cognitive anomalies [12]. However, given the frequent occurrence of IEDs, which are particularly pronounced during critical developmental periods, recent studies examined the impact of SeLECTs on neuropsychological functioning [13–18]. These studies suggested that, even with normal general intelligence [12], children with SELECTs may exhibit neuropsychological impairments in various domains [16–18].

Children with SELECTs may in fact exhibit executive vulnerabilities, such as difficulties in interference control and cognitive flexibility tasks [19] and a poor working memory [20]. Parent-reported questionnaires indicate challenges with distractibility, concentration, temperament, mood swings, impulsivity, and the ability to follow instructions [21].

It is therefore relevant to characterize the neurocognitive profile and objectively detect cognitive and behavioral difficulties, including high-level processes such as EF, to identify individuals who require more in-depth assessment and establish a baseline for a follow-up [22]. The baseline is essential in a dynamic condition such as epilepsy, where neuropsychological functioning may be modulated by multiple time-dependent factors, including clinical, psychological, and iatrogenic influences [23].

Although neuropsychological screening at the onset of epilepsy is recommended for newly diagnosed individuals [24], its implementation and the longitudinal monitoring of all patients remain challenging [22]. Such assessments may be perceived as complex and demanding by both children and families. Elevated healthcare costs and prolonged waiting times place additional pressure on already overburdened health systems, further limiting timely access to services. These barriers have encouraged growing interest in remote assessment solutions for children with epilepsy [25].

The study aimed to evaluate the feasibility of a neuropsychological tele-assessment procedure in school-aged children with SeLECTs. Hypotheses tested were: (1) The protocol would demonstrate high acceptance and usability among children and families; (2) The procedure would be effective in identifying specific cognitive, learning, and behavioral vulnerabilities associated with SeLECTs.

2. Methods

2.1. Study design and procedure

This is a cross-sectional, observational cohort study, approved by the Ethics Committee of the X (for Blind revision) Region (approval number: n 42/2023, date 10/10/2023).

All participants underwent clinical, EEG, and neuropsychological assessments. The neuropsychological assessment was conducted entirely remotely via telemedicine, using Google Meet and a web-based platform (TeleFE, Cooperativa Anastasis [26]). To ensure that the remote assessments were conducted without technical issues (e.g., freezing, temporary connection loss) or interruptions, families were provided with specific guidelines [8,25]. Informed consent was obtained from parents.

Parents were instructed to set up a laptop (11–13 inches) on a table free of other objects, at a height appropriate for the child. Additionally, they were asked to select a quiet and well-lit room, free from distracting stimuli, with a stable internet connection. It was also necessary that the child be properly seated in front of the computer, with hands positioned comfortably to operate the keyboard.

Parents were explicitly informed that they could not intervene during the assessment by providing suggestions, repeating instructions, or naming stimuli.

For each child, two online sessions, each lasting one hour, were scheduled. The first session included a period of familiarization for both the child and the parents with the devices and the procedure. During this time, internet speed was tested, and any technical issues were resolved. Two clinicians participated in each session: one who interacted directly with and assessed the child, and a second one who monitored the behavior of both the child and the accompanying parent. If the child exhibited signs of fatigue or difficulty during testing, the session was paused and rescheduled. Within 2–3 weeks of completing the full assessment process, parents received a brief written report and oral feedback from the child's pediatric neurologist.

The telemedicine assessments were scheduled based on the availability of the families facilitating participation for children with difficulties in accessing the hospital or those living in remote areas.

The study was carried out between January 2024 and April 2025.

2.2. Participants

A total of 47 children with SeLECTs, including 15 on anti-seizure medication (ASM) were recruited.

The inclusion criteria required participants to a) be between 6 and 13 years old, of either sex, and; b) have a diagnosis of SeLECTs according to the criteria established by the International League Against Epilepsy (ILAE).

The exclusion criteria included a) evidence of known structural epileptogenic lesions; b) evidence of focal neurological deficits upon clinical examination; c) IQ below the 25th percentile; and d) absence of informed consent.

Participants were not selected based on signs of neuropsychological impairment but were enrolled for the specific aims of the study, either at the time of diagnosis or contacted if they had previously received a diagnosis in the same department.

The sample included one child with a diagnosis of Attention Deficit Hyperactivity Disorder (ADHD), and two with Specific Learning Disorder (SLD) as comorbidities.

Given its observational nature, the study did not imply any modifications to the standard clinical or therapeutic management.

2.3. Assessment

The clinical history of all patients was collected through the clinical charts and an interview with the parents. All children underwent

periodic video-EEG recordings and clinical assessments as part of the routine evaluation of patients with epilepsy in our center.

The neuropsychological assessment included the evaluation of:

- Non-verbal reasoning: Colored Progressive Matrices (CPM, [27])
- Expressive Vocabulary: WISC-IV subtest [28]
- Verbal fluency: Neuropsychological Assessment Battery (BVN, [29])
- Executive Functions: TeleFE [26].

Whereas CPM-WISC-IV subtest, and BVN are traditional instruments adapted to the tele-assessment procedure (e.g. providing the pictures on a shared file during the videocall), TeleFE is a battery specifically developed and standardized for the tele-assessment of school aged children. The battery comprises 4 subtests assessing basic executive abilities such as response inhibition (Go/NoGo), interference control and cognitive flexibility (Flanker), updating (N-Back) and planning (TPQ).

As part of the tele-assessment session, clinicians completed the Martinovic Questionnaire [30], an observational tool aimed at evaluating the child's engagement in digital activities.

Parents of children completed three different questionnaires sent via mail (PDF) or link:

- Experience and satisfaction with tele-assessment: Feasibility questionnaire;
- Everyday executive behaviors: "Questionnaire for EF assessment" (QUFE) [26]
- Children's learning skills: Learning questionnaire.

A detailed description of the procedures and tools used for the clinical and neuropsychological assessments is reported in the Supplementary Materials.

3. Results

3.1. Acceptance and usability

Of the initial 47 children with SeLECTs recruited for the study, 4 withdrew due to the unavailability of a computer ($n = 2$), a personal decision or clinical reason (seizure after the first assessment) to discontinue participation ($n = 2$).

The final sample included 43 children. All children reached linguistic and motor milestones on time. None were born preterm, nor did they present with pre- or perinatal complications or neurological disorders. Eleven out of 43 had a positive family history for epilepsy. Demographic and clinical characteristics related to epilepsy are presented in Table 1.

All sessions were completed without interruptions, as none of the testing sessions had to be paused or restarted. Fig. 1

On the Martinovic scales completed by the clinicians, all items indicated a high level of engagement in almost all children, with mean scores above the midpoint for positive items and below it for negative ones (Fig. 2).

The levels of attention and cognitive effort were high whereas the levels of frustration, difficulties in comprehension, anxiety, distraction, and need for encouragement were low. Enjoyment slightly exceeded the average levels.

In the Feasibility Questionnaire (FQ), parents reported mean scores above the midpoint value for satisfaction with the information provided, adequacy of instruction, adequacy of effort required, and tolerance of the proposed test (Fig. 3).

The majority of the parents, 64.1 %, considered the tele-assessment very useful for receiving information about their child, 25.6 % found it interesting but not particularly useful, 7.7 % reported that it added nothing new, and 2.6 % disagreed with the assessment findings.

Furthermore, 79.5 % of parents declared that they had not encountered any obstacles during the tele-assessment procedure, while 17.9 % reported experiencing connection difficulties, and only 1 family declared lack of collaboration on the part of the child (2.6 %). In general, 92.3 % reported that the procedure to access the platform was easy or very easy, with only 7.7 % reporting some difficulties. Finally, only 10.2 % declared that they preferred in person assessment, while 89.7 % reported that such an assessment was a valid and effective procedure.

All the tasks included in the protocol were successfully administered remotely.

Table 1
Demographic and clinical characteristics of the sample and assessment completion rates.

	N (%)
Gender	Male = 24 (55.8 %)
Pharmacological treatment	Yes = 15 (34.88 %)
Bilingualism	Yes = 3 (6.98 %)
Residents in the same region of the hospital	Yes = 31 (72.09 %)
(minimum distance to the nearest external region = 70 km)	No = 12 (27.91 %)
Residents in the same province of the hospital	Yes = 15 (48.39 %)
(distances from the hospital ranging between 25 and 140 km)	No = 16 (51.61 %)
	M (SD)
Age (years)	9.59 (1.63) (range: 6.09 - 13.09)
Age at seizures onset (years)	6.75 (1.89) (range: 3.03 - 10.05)
Distance from onset (months)	35.26 (25.08)
	N (%) - Completion rates
Colored Progressive Matrices (CPM)	43 (100 %)
Vocabulary (WISC-IV)	43 (100 %)
Phonemic and semantic fluency (BVN)	43 (100 %)
Executive functions battery for tele-assessment (TeleFe)	43 (100 %)
	*TPQ = 37 (100 %)
Learning questionnaire	43 (100 %)
Everyday executive behaviors questionnaire (QUFE)	39 (90.70 %)
Feasibility questionnaire	39 (90.70 %)

* due to age constraints (age > 8 years).

3.2. Neuropsychological profiles

All measures obtained through the neuropsychological assessment are reported in Table 2. All children obtained scores within the normative range on the CPM; 4.6 % of children obtained borderline scores, but not below the normative range. At the Vocabulary Test, 30.23 % of children had either a borderline or clinical score. In the Fluency task, 51.1 % and 32.6 % of children had either a borderline or a clinical score in the phonemic and semantic task respectively. At the TeleFE tasks, seven children (16.28 %) obtained uninterpretable scores (i.e. non-adherence or random responses in the basic conditions of the tasks), 51.16 % deficient, and 27.09 % border, for a total ranging from 20.93 % to 72.97 % of children showing either a borderline or a clinical (deficit or not interpretable) score in at least one measure.

The highest percentages were found in the speed-related indices and in the tasks measuring CF, high-load WM, and P. At the QUFE questionnaire the scores falling in the borderline and clinical range ranged from 28.29 % to 43.59 %, with a higher incidence of difficulties in Cognitive self-regulation (35.90 %), Material organization (43.59 %) and Flexibility adaptation (35.90 %).

In the Learning questionnaire, the percentage of children scoring in the borderline range was 18.60 % and the percentage of those below the normative level was 30.23 %. According to reports, the main difficulties were observed in writing tasks.

3.2.1. Relationship between feasibility and neuropsychological profile

Correlation analyses showed relationships between the Martinovic

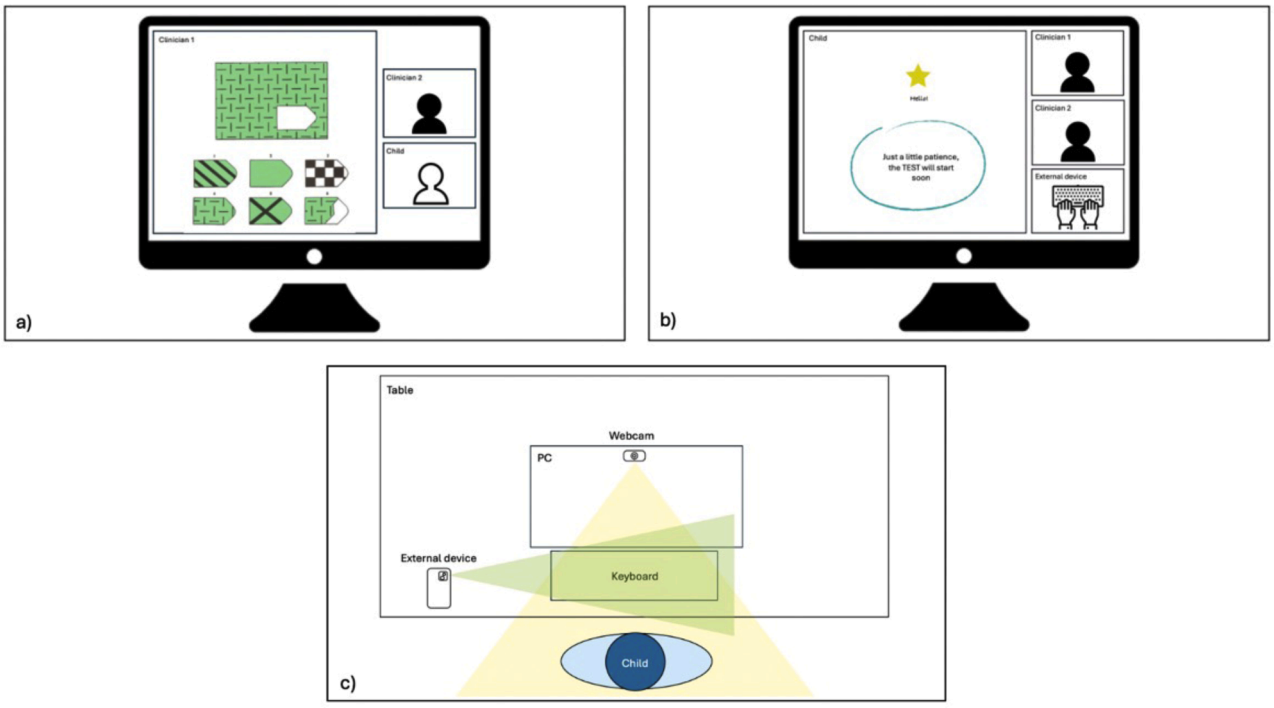

Fig. 1. Experimental setting: a) Configuration used during the first session of remote tele-assessment.; b) Configuration used during the second session of remote tele-assessment: c) Child's home assessment setting with two devices.

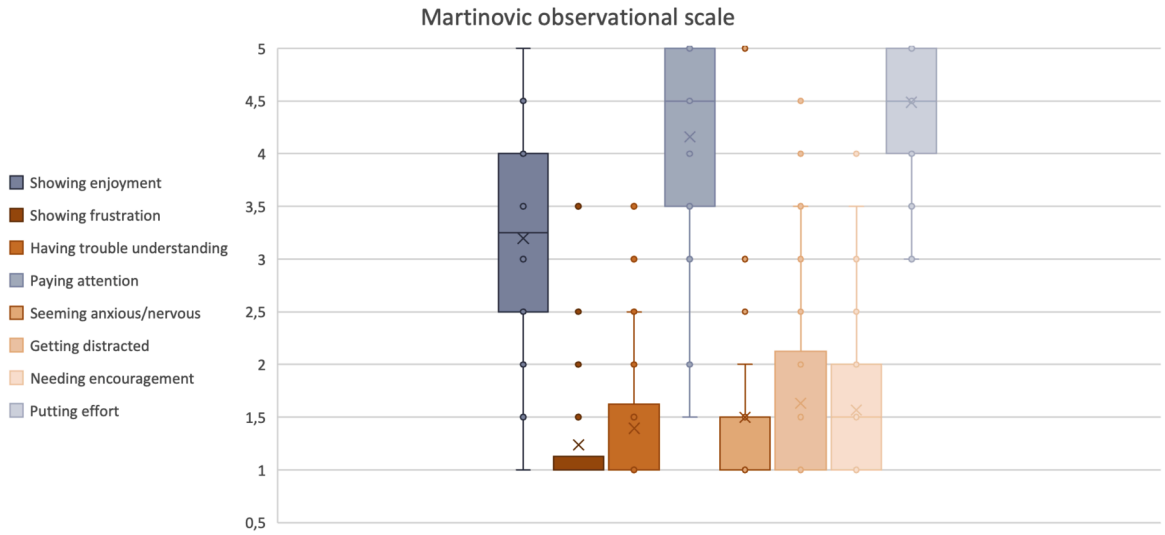

Fig. 2. Box plot of the engagement scores at the Martinovic Observational Scale. The y-axis displays questionnaire scores measured on a Likert scale ranging from 1 to 5, where 1 corresponds to "Strongly Disagree" and 5 to "Strongly Agree".

scale and neuropsychological measures (CPM, Vocabulary, Fluency tests, and EF indices). For these analyses, all negative items of the Martinovic questionnaire were reverse coded so that higher scores consistently reflect greater engagement and fewer difficulties. Statistical results are reported in Table 3, only significant correlations are shown.

4. Discussion

The present study evaluates the feasibility of a fully remote neuropsychological tele-assessment procedure in a clinical pediatric population with Self-limited epilepsy with centrotemporal spikes (SeLECTs).

A total of 43 children, aged 6 to 13 years, participated in 2 online neuropsychological assessment sessions. Parents completed questionnaires regarding the feasibility of the remote procedure, children's executive function-related behaviors and learning performance. The assessment setting followed the best practices recommended by literature on tele-assessment in developmental populations [8,25]. A structured protocol to standardize the tele-neuropsychological assessment across the various stages of instruction, familiarization, administration, and feedback was implemented. This protocol proved effective in ensuring the completion of the tele-assessment, as only 1 out of 44 children discontinued the assessment.

Each tele-assessment session involved two clinicians, which facilitated task administration and technical management. However, the presence of two evaluators is recommended during the initial stages of the study to standardize and harmonize assessment procedures. Once

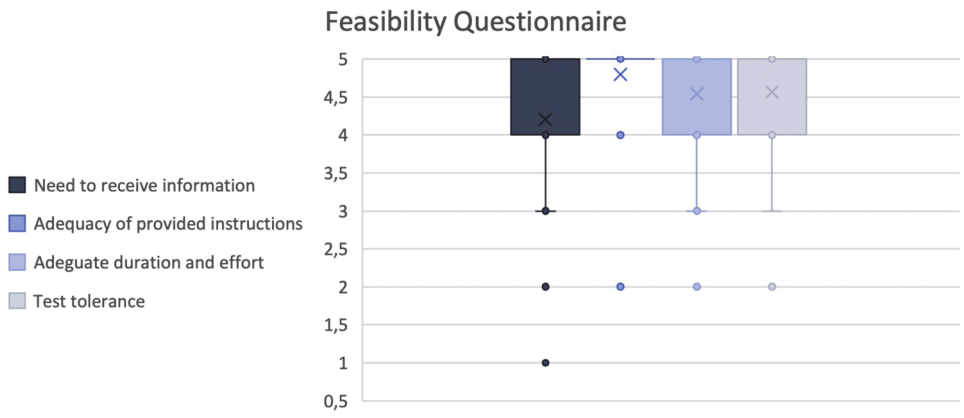

Fig. 3. Box plot of the feasibility scores at the Feasibility Questionnaire-like items. The y-axis displays questionnaire scores measured on a Likert scale ranging from 1 to 5, where 1 indicates very low and 5 indicates very high.

Table 2
Descriptive statistics of the tele-assessment measures.

Measures	N	Mean (SD)	Min	Max	% borderline score	% clinical score
Vocabulary (weighted scores)	43	9.88 (3.42)	4	19	27.91 %	2.32 %
Phonemic Fluency (standardized scores)	43	86.41 (16.13)	64.10	147.30	37.21 %	13.95 %
Categorical Fluency (standardized scores)	43	91.90 (17.34)	56.10	152.00	23.25 %	9.30 %
		Median (IQR)				
IR- Accuracy (percentile)	43	50 (25–75)	0	100	13.95 %	13.95 %
IR- Speed (percentile)	43	35 (12.5–60)	0	90	23.25 %	16.28 %
IC - Accuracy (percentile)	43	55 (30–77.5)	0	100	11.63 %	11.63 %
IC - Speed (percentile)	43	45 (15–67.5)	0	100	18.60 %	16.28 %
CF - Accuracy (percentile)	43	55 (25–80)	0	100	16.28 %	11.63 %
CF - Speed (percentile)	43	30 (15–70)	0	100	20.93 %	20.93 %
WM (low) - Accuracy (percentile)	43	70 (30–90)	0	100	16.28 %	9.30 %
WM (low) - Speed (percentile)	43	55 (35–67.5)	0	100	16.28 %	4.65 %
WM (high) - Accuracy (percentile)	43	45 (25–87.5)	0	100	20.93 %	11.63 %
WM (high) - Speed (percentile)	43	30 (17.5–75)	0	100	25.58 %	16.27 %
P -Accuracy (percentile)	37*	30 (20–55)	1	80	21.62 %	13.51 %
P- Speed (percentile)	37*	10 (5–30)	1	75	32.43 %	40.54 %
QUFE- Cognitive self-regulation (percentile)	39	70 (20–80)	0	100	10.26 %	25.64 %
QUFE - Behavioral self-regulation (percentile)	39	60 (30–80)	0	100	10.26 %	20.51 %
QUFE - Material organization (percentile)	39	50 (10–70)	0	100	23.08 %	20.51 %
QUFE - Flexibility adaptation (percentile)	39	50 (30–70)	0	90	10.26 %	25.64 %
QUFE - Initiative (percentile)	39	60 (30–70)	0	100	10.26 %	17.95 %
		Media (ds)				
Total Learning	43	8.35 (10.35)	0	40	18.60 %	30.23 %

* Exclusion of children under 8 years of age
IR: response inhibition; IC: interference control; CF: cognitive flexibility; WM-low/high: working memory at low/high cognitive load; P: planning.

Table 3
Significant correlations between the scores at the Martinovic scale and the neuropsychological measures. (*) Accuracy; (°) Speed.

	CPM	Vocabulary	IC (TeleFe)	CF (TeleFe)	WM-low (TeleFe)	WM-high (TeleFe)	P (TeleFe)
Showing enjoyment		rho = 0.54 $p < .001$					
Showing frustration	rho = 0.37; $p = .021$	rho = 0.38; $p = .020$				*rho = 0.49; $p = .002$ °rho = 0.39; $p = .017$	
Having trouble understanding				*rho = 0.44; $p = .006$		*rho = 0.45; $p = .005$	*rho = 0.37; $p = .035$
Paying attention	rho = 0.41; $p = .012$		*rho = 0.50; $p = .001$	*rho = 0.49; $p = .002$	°rho = 0.37*; $p = .021$	*rho = 0.43; $p = .007$	*rho = 0.58; $p < 0.001$
Getting distracted			*rho = 0.42; $p = .009$	*rho = 0.35; $p = .033$	°rho = 0.35; $p = .029$		*rho = 0.36; $p = .045$
Needing encouragement					*rho = 0.40; $p = .014$		*rho = 0.54; $p = .001$
Seeming anxious/nervous						*rho = 0.43; $p = .007$	
Putting effort						*rho = 0.34; $p = .039$	

inter-rater consistency has been established, tele-assessment can be conducted by a single clinician.

Similarly, administration of questionnaires to parents was accessible to all and did not require further instructions from clinicians, with response rates between 90 % and 100 %. This procedure, which was widely used before tele-assessment was adopted, sometimes faced limitations, such as low participation or incomplete survey responses. In this study, by integrating parent questionnaires with the direct tele-assessment of the child parental engagement and compliance was likely enhanced, resulting in a limited amount of missing data.

To quantitatively assess the child's engagement during task performance, clinicians completed a behavioral observation scale (Martinovic scale), previously employed in studies involving children in digitized activities [31]. Indeed, in remote settings reduced child-operator interaction might cause child engagement and response monitoring to be lower compared to in-person assessments. It is therefore considered best practice to complement tele-assessment with a structured behavioral observation [32].

The Martinovic scale highlighted high levels of cognitive engagement and low levels of frustration, anxiety, and nervousness, indicating that the tasks proposed were well-received by the children. The high scores related to attention and effort suggested that the activities require significant cognitive control, help to maintain high levels of concentration, and reduce distractions.

The feasibility of the procedure was investigated through a feasibility questionnaire completed by parents. The data highlighted a high satisfaction in receiving information about their child's cognitive profile and needs. The tele-assessment was also judged highly tolerable in terms of time and effort. Most parents reported no difficulties in using the remote procedure, while a small proportion identified internet connection issues as the only obstacle, and only one parent reported problems related to the child's lack of cooperation. Almost all parents found the platform access procedure simple, and most expressed a preference for remote over in-person assessment. These findings contribute to the literature on pediatric tele-medicine by supporting the idea that remote neuropsychological assessment could be feasible and well received by most families [22].

Correlations between the Martinovic observational scale and EF indices provide valuable insights into the cognitive load perceived by children during remote assessment. Specifically, items related to frustration, anxiety, difficulty in comprehension, and need for encouragement showed significant associations with WM tasks, suggesting that these activities are perceived as cognitively demanding and emotionally burdensome.

Furthermore, items related to maintaining attention and putting effort were positively correlated with many EF indices, suggesting a good capacity for challenge and an adequate level of engagement, even in a remote setting. These findings provide valuable insights for neuropsychological tele-assessment, suggesting that clinicians should consider the cognitive and emotional effort required by the tasks to potentially personalize administration to the more vulnerable children.

The protocol adopted made it possible to identify various weaknesses in EF and learning abilities, despite the absence of global cognitive deficits [12]. All children scored within the normative limits (>5th percentile) at the CPM, with only a small percentage falling in the borderline range.

Conversely, the tele-neuropsychological assessment revealed that between 2.32 % and 72.97 % of the children exhibited impairments in expressive language and/or executive control, including children that got uninterpretable scores at TeleFE, resembling a severe difficulty in performing executive functions tasks. The TeleFE platform enabled an in-depth analysis of the most frequent difficulties observed in children with SeLECTs. Specifically, greater weaknesses emerged in tasks measuring cognitive flexibility (CF), working memory (WM), and planning (P). According to parent reports, difficulties were also evident in behaviors related to the organization of materials, cognitive regulation, and behavioral flexibility. These findings indicate that clinical assessment of children with SeLECTs should include a neuropsychological assessment, to provide an objective account of the vulnerabilities that these patients and their parents experience in daily life [33].

Accordingly, the study also revealed that a large proportion of the sample scored at borderline or below-norm levels in at least one learning domain, which are known to be affected by impairments in language processing and executive control.

4.1. Conclusion, limitations, and future perspectives

The present study explores the feasibility of a fully remote neuropsychological assessment in a pediatric clinical population with epilepsy. The results confirm that this modality is well tolerated and accepted by the children, who demonstrated high levels of engagement and collaboration throughout. These findings suggest potential future applications of tele-assessment in clinical settings, to facilitate access to services and implement protocols for continuous monitoring over time. Integrating specific platforms for neuropsychological tele-assessment with traditional tools adapted for remote administration may offer a reliable tool for evaluating cognitive functioning in children with epilepsy.

The procedure also proved sensitive in detecting difficulties across various domains, executive and academic, emphasizing the importance of early and thorough assessment in these populations.

Despite these promising results, some limitations should be acknowledged. First, the sample of children with SeLECTs was relatively small, which may limit the generalizability of the findings. In addition, the cross-sectional design precludes conclusions regarding the stability of executive functioning over time. Therefore, longitudinal studies including larger samples and follow-up assessments would be particularly informative in determining whether executive and cognitive functioning characterize the population of children with SeLECTs and remain stable across development. Finally, an important limitation concerns the absence of a direct comparison with an in-person assessment condition for the neuropsychological measures. Although recruiting an in-person control group in this clinical population is challenging, as cognitive difficulties are often mild, such a comparison would have strengthened the validity of the findings.

Future studies with larger and more diverse samples will be crucial to consolidate the effectiveness of tele-assessment in other epilepsy types where EF deficits are known to potentially affect psycho-social outcomes.

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Ethics statement

The research was approved by the Ethics Committee of the Region of Tuscany - Paediatrics (approval number: n 42/2023, date 10/10/2023). The research was carried out following the Ethical guidelines of the Italian Association of Psychology and the Declaration of Helsinki.

Data availability statement

The data presented in this study are available on request from the corresponding author.

Conflicts of interest

The authors declare no conflicts of interest.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.seizure.2026.02.004.

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