

# PREPARATION AND DESENSITIZATION IN VIEW OF PERFORMING VIDEO ELECTROENCEPHALOGRAPHY IN CHILDREN WITH AUTISM SPECTRUM DISORDER: A CASE SERIES

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## SUMMARY

EEG recording in children on the autism spectrum is often a challenging task due to their frequent hypersensitivity to even mild sensory stimuli and difficulty coping with novel situations outside of familiar routines. This article describes the video electroencephalography (EEG) preparation process carried out with five children diagnosed with Autism Spectrum Disorder (ASD), using a structured protocol of gradual exposure and environmental desensitization involving outpatient staff and the presence of parents. The high success rate in both EEG acquisition and patient cooperation underscores the clinical importance of structured preparation and desensitization protocols in facilitating EEG procedures for children and adolescents with ASD. In this study, gradual and playful exposure - anchored in predictable routines and symbolic play - helped modulate sensory input, addressing a core challenge in ASD. The intervention also leveraged the psychological benefits of increased environmental predictability, which plays a crucial role in reducing anxiety driven by uncertainty in individuals on the autism spectrum. Moreover, the active involvement of caregivers likely supported co-regulation and emotional safety, further contributing to the successful outcomes observed. These findings advocate for the integration of individualized, behaviourally informed protocols into routine clinical practice for neurophysiological assessments in children with ASD.

**Key words:** autism – electroencephalography – desensitization

**Abbreviations:** ASD: autism spectrum disorder; EEG: electroencephalography

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## INTRODUCTION

People with autism spectrum disorder (ASD) characterized by persistent deficits in social communication and social interaction in a variety of contexts and patterns of restricted and repetitive behaviors, interests, or activities have a higher risk of epilepsy than the general population (Liu et al. 2022). Electroencephalography (EEG), although not essential to make a diagnosis on epilepsy, can often provide highly useful indications for diagnostic framing and choice of anti-seizure medications (Riquet et al. 2011). EEG can also provide indications as to whether brain bioelectrical function is within the normal range in relation to the child's age and identify possible abnormalities worthy of further diagnostic investigation (Eisermann et al. 2013). Italian National Guidelines on the diagnosis and treatment of autism spectrum disorder in children and adolescents recommend daytime or sleep EEG in children with language or global regression, regardless of whether seizures are observed (Linee guida ISS 2023). EEG recording in children on the autism spectrum is often a challenging task due to their frequent hypersensitivity to even mild sensory stimuli and difficulty coping with novel situations outside of familiar routines. The resulting state of psychomotor agitation often makes it impossible to perform the test.

In clinical practice, successful EEG preparation and recording require the child to remain sufficiently still to allow for proper electrode placement and to prevent the trace from being obscured by motion artifacts. To overcome the challenge of getting children with ASD to accept the EEG recording setting, the placement of pre-wired EEG caps or cupped electrodes on the scalp after adequate skin cleansing, and to be calm during the recording time (30-60 minutes), we sought a desensitization strategy to facilitate the performance of the test.

## SUBJECTS AND METHODS

Each child with ASD, for whom a request for a video EEG had been made at the pediatric epilepsy outpatient clinic of the Seraphic Institute of Assisi, was given an appointment one week before at the same outpatient clinic where the recording would take place. During that session, the child was given the opportunity to become familiar with the environment and examiner, in the presence of a parent, first through free play with toys and objects in the room. Next, the child was proposed to lie down on the registration bed and watch TV with a program chosen by him or proposed by the parent according to his preferences. Finally, the pool game (known to all patients) was proposed in which the

child and parent were asked to put on the pre-wired EEG caps to simulate entering the pool. In relation to the child's acceptance, several attempts were made, gradually increasing the tolerance time and also proposing skin cleansing, always within the symbolic game. The proposed game also included taking some photos, alone or with parent with the EEG cap, to show to the child, and numerous gestural positive reinforcements such as clapping hands or "give me 5." At the end of the session, it was proposed to the parents to repeat the pool game daily at home, reminding the child of the next appointment at the same clinic. This procedure was in the timing and manner adapted to the verbal - communicative abilities of each child. On the day of the EEG recording appointment, the child was greeted by the same operators, remembering the things done in the same environment and repeating the same procedure: free play, lying on the clinic bed with the TV on and favorite program, wearing the pre-wired EEG cap after cleansing the skin. During the recording, the favorite TV program was maintained or the child was entertained with each child's favorite activities and objects (sensory ball, stuffed animals, toy cars etc.). In case EEG sleep was required, a parent was asked to lie down with the child in the clinic bed, the TV was turned off and the room darkened. Consent for the publication of the case series was obtained from the children's parents.

## RESULTS

Preparation for video EEG was performed in 5 children, all males. The mean age was 12 years (range 8-18 years). Other clinical characteristics are summarized in Table 1. Three children (3/5) had never performed this examination due to opposition to the test procedure. All children (5/5; 100%) were able to cooperate with EEG recording without enacting dysfunctional behaviors. Of these 3 reached the sleep stage with melatonin administration and in one case with promazine. Two patients performed a second video EEG in sleep for diagnostic completion with the same preparation methods as the previous video EEG. The average recording duration was 60 min (range 30 - 75 min). The quality of the recording was very good in 4 cases; in one case many motion artifacts were

present but not such as to prevent the reading of the tracing. In all cases, the parents expressed appreciation for the preparation done and the success of the examination.

## DISCUSSION

Children with ASD frequently show difficulty in cooperating in maneuvers, where the proposed sensory stimuli may be unpleasant, and the new environment and figures may generate anxiety and fear. The preparation phase for EEG recording can therefore be stressful and trigger psychomotor agitation reactions in children with ASD. Sedation for EEG can be achieved with drugs such as dexmedetomidine or chloral hydrate with good results and mostly mild adverse events, but these drugs, particularly dexmedetomidine, require the presence of anesthetist or medical personnel trained in airway management and resuscitation (Derakhshani et al. 2022, Chen et al. 2020). Melatonin provides moderate success with an acceptable safety profile, and it can be used in a non-hospital setting (Ross & Nicolson 2006). Medications commonly used for sedation and hypnosis (such as benzodiazepines) are not used in EEGs as they can alter brain bioelectric activity and temporarily mask possible epileptiform abnormalities. (Niedermeyer & Lopes da Silva 2005). When performing a pediatric EEG, it is very important to record the transition phases between wakefulness and sleep, as these phases are more likely to reveal latent or activated epileptiform abnormalities (Peltola et al. 2023). For these reasons, the use of non-pharmacological techniques for EEG recording outside the hospital setting, minimizing the risks of sedation and enabling recordings in various states of wakefulness and sleep, is clinically relevant, especially in children with neurodevelopmental disorders. The cases described show how adequate preparation for adaptation and desensitization to sensory stimuli that might be poorly tolerated by children with ASD can facilitate the performance of EEG, useful for correct diagnostic framing and prescribe targeted therapies. A similar methodology, requiring less environmental adaptation but more closely tailored on each child's play preferences, has been successfully implemented with six children with ASD residing at the Seraphic Institute.

**Table 1.** Patients' clinical characteristics and video EEG registration outcome

Code	Gender	Age	ASD	Comorbidities	Reason for referral	VEEG type
A	M	11	non-verbal, ID; level 3	Epilepsy	focal seizures	awake - sleep
B	M	13	verbal; level 2	PANDAS	abnormal movements/tics	awake
C	M	8	verbal; level 2		abnormal movements/tics	awake - sleep
D	M	10	non-verbal, ID; level 3	behavioural disorder	epileptiform activity	awake-sleep
E	M	18	verbal, ID; level 3	headache	psychomotor agitation	awake

From a psychological standpoint, gradual desensitization represents a form of habituation in which repeated, non-threatening exposure to feared stimuli - such as the EEG cap or medical environment - leads to a reduction in the autonomic and emotional responses associated with those stimuli. This is consistent with well-established cognitive-behavioral models of anxiety management, in which avoidance perpetuates fear while exposure facilitates extinction learning (Craske et al. 2008).

Individuals with ASD often exhibit sensory hypersensitivity and hyper reactivity to environmental stimuli, which are associated with heightened baseline arousal and atypical neural processing of sensory input (Robertson & Baron-Cohen 2017). These characteristics may amplify procedural anxiety and stress responses, especially in medical contexts. Therefore, targeting sensory modulation through structured, predictable exposure has both behavioral and emotional regulation benefits. Evidence suggests that the inclusion of personalized, child-centered routines and reinforcement strategies significantly enhances engagement and reduces maladaptive behaviors during medical procedures (Stahlberg et al. 2022). Moreover, the concept of predictability plays a central role in desensitization protocols for individuals with ASD. Cognitive neuroscience research has shown that children on the spectrum often rely on rigid internal schemas to manage environmental uncertainty; when such schemas are disrupted, it may lead to anxiety or even behavioral shutdown (Van de Cruys et al. 2014). The preparatory session described in our protocol - familiarizing the child with the clinical setting, personnel, and procedural steps - may have served to reduce such uncertainty, thereby improving cooperation and psychological safety. Recent clinical studies have further emphasized the value of incorporating symbolic play and narrative frameworks into medical desensitization procedures. Social stories, role-playing, and playful metaphors (e.g., "the pool game" to simulate cap placement) help reframe potentially aversive tasks into emotionally neutral or positive experiences (Gray 2020; McLay et al. 2021). These techniques align with the principles of child-centered care and developmental behavioral pediatrics, where the child's agency and emotional experience are actively considered during intervention planning. Finally, it is worth noting that the success of such desensitization protocols may also be linked to caregiver involvement. Parental modeling and emotional co-regulation are key mechanisms in shaping the child's response to novel stimuli, particularly when the parent is engaged in the same procedures in a calm, playful, and supportive manner (Neuhaus et al. 2014). This underscores the systemic and relational dimension of procedural desensitization in neurodivergent populations.

## CONCLUSIONS

The success rate in both EEG acquisition and patient cooperation in this cases series underscores the clinical importance of structured preparation and desensitization protocols in facilitating EEG procedures for children and adolescents with ASD. These findings advocate for the integration of individualized, behaviourally informed protocols into routine clinical practice for neurophysiological assessments in ASD. Future research should investigate the scalability of these methods and their long-term effects on medical desensitization and patient well-being.

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### Contribution of individual authors:

Ornella Ciccone: study design, literature searches, manuscript writing, reviewed.

Alessandro Lepri: literature searches, manuscript writing, reviewed.

Guido Camanni, Massimo Vallasciani & Sandro Elisei: reviewed and approved the manuscript.

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