

Challenges in Screening Children with Autism Spectrum Disorder in Healthcare Settings -A field Case Study at the Medical Imaging Department

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Abstract:

Children with autism spectrum disorder face particular difficulties when undergoing medical imaging examinations, due to sensory hypersensitivity, communication difficulties and resistance to change, whilst radiology staff are often inadequately trained to deal with these specific challenges. Using a descriptive case study approach, this study presents a field experience of a chest X-ray examination of a girl with autism spectrum disorder, based on direct observation and an interview with the patient's carer, with the aim of analysing the difficulties encountered by the radiographer and the strategies that enabled the examination to be completed successfully. A diagnostic chest X-ray was obtained by adapting the examination environment and positioning the radiographer outside the patient's field of vision, despite a slight deviation in positioning. The study recommends specialised training for medical imaging staff, enhanced coordination between the health and higher education sectors, and the involvement of an speech-language pathologist/therapist in preparing for such examinations.

Keywords: autism spectrum disorder; medical imaging department; medical imaging technician; chest X-ray; case study.

1. Introduction

Autism spectrum disorder is defined in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) as a neurodevelopmental disorder that manifests in early childhood, characterised by persistent deficits in social communication and interaction, and restricted, repetitive patterns of behaviour and interests, often associated with hyper- or hypo-responsiveness to sensory stimuli (American Psychiatric Association, 2013). The manual classifies the severity of the disorder into three functional levels based on the extent of support required; this classification has direct implications in the context of medical imaging, as it requires the imaging technician to carry out a rapid initial assessment of each patient's level of independence before commencing the examination, rather than treating the disorder as a homogeneous category. These characteristics intersect with the requirements of radiological examinations in several ways; the examination requires the patient to maintain a specific physical position and remain completely still, which conflicts with difficulties in verbal communication, resistance to change, and hypersensitivity to sounds, lighting and physical touch—traits common to this group. (Mehdi Zammam, 2008; Mohand, 2021)

This study draws on Dunn's model of sensory information processing (Dunn, 1997) and the Autistic SPACE framework—which summarises the needs of patients with autism spectrum disorder within healthcare settings, most notably sensory needs and the predictability of examination procedures (Doherty et al., 2023) the application of these two frameworks to the case data will be detailed in the discussion section. The specialist literature on the experiences of medical imaging staff working with this group remains relatively recent, despite its growing volume; recent surveys in the UAE (117 imaging specialists) and the UK (130 MRI specialists) have shown that the level of knowledge and specialist training required to deal with this group remains below what is required (Abdelrahman et al., 2024; Stogiannos, Carlier, et al., 2022).

Field studies in the context of conventional radiology remain very limited in the Arab world and Algeria, which means that documenting such experiences adds value in bridging the gap between theoretical knowledge and practical application.

Children with autism spectrum disorder, like other children, may have to undergo radiology examinations; however, unlike disorders with obvious physical characteristics, this condition is not physically apparent and is not sufficiently understood even by some healthcare professionals. This challenge is exacerbated in sensitive examinations such as chest X-rays (Télé Thorax) used to screen for tuberculosis. This is particularly true as the alternative sputum test requires conscious cooperation, which is difficult to achieve with this group, leaving the chest X-ray the most practically viable option despite the need for the child to remain in a fixed position and be completely still. Hence the central question of this study: how can a medical imaging technician perform a diagnostically valid chest X-ray on a child with an autism spectrum disorder, in the absence of specialised training and adequate adaptation of the examination environment? To answer this question, the study aims to highlight the characteristics of the disorder through a real-life field study, present the experience of a chest X-ray examination for a girl with an autism spectrum disorder, document the radiographer's experience in dealing with her, and clarify how to handle the situation professionally during the examination to ensure a correct diagnosis.

2. Methodology

2.1 Study Design and Rationale

This study adopted the descriptive case study approach, as the most appropriate method for documenting a complex individual clinical phenomenon in its natural context, particularly when it is not possible to control for variables or generalise the findings to a wider sample. This approach is particularly suitable for rare cases or those insufficiently covered in the local literature, as it provides documentation rich in fine details that might be lost in large-scale quantitative studies, and enables the generation of preliminary, testable hypotheses and practical recommendations that can subsequently be tested in larger studies. In terms of both form and content, this study has followed the general principles of the CARE (CAse REport) guidelines for writing clinical case reports, which recommend the inclusion of key elements, including: patient information, a timeline of events, diagnostic assessment, therapeutic/procedural intervention, follow-up and outcomes, and a discussion relating to the literature, with the aim of enhancing the report's completeness, transparency and usefulness in clinical practice (Gagnier et al., 2013).

Element	Details
Study Design	Descriptive case study, following the general elements of the CARE Case Report Guidelines
Sample	A 13-year-old girl diagnosed with Autism Spectrum Disorder (ASD), purposively selected as a convenient case during routine service delivery in the radiology department
Communication Pattern	Nonverbal
Examination Setting	Radiology Department, Mother-and-Child Specialized Hospital
Data Collection Instruments	Direct, non-participant observation of patient behaviors during examination; brief semi-structured interview with the accompanying person (sister)
Timing of Data Collection	Real-time observation during examination, supplemented by info from the accompanying person immediately prior (when ASD diagnosis was first disclosed)

2.2 Context and setting of the examination

During one of my shifts, I received a 13-year-old female patient at the radiology department of a specialist maternity and paediatric hospital, accompanied by her sister, for a chest X-ray (Télé Thorax), due to a suspected case of tuberculosis, as stated in the referral form. The radiology suite is characterised by the presence of continuously operating machines and equipment that emit constant noise, in addition to bright lighting directed directly towards the examination area.

2.3 Intervention Procedures

Given the difficulty in getting the patient to maintain the examination position despite repeated attempts to calm her, both by the examiner directly and with the help of the accompanying person, it was decided to adopt the following procedural strategy:

- The examiner withdrew completely from the patient's field of vision.
- The patient was left alone with her sister inside the examination room.
- Instructing the accompanying person (the sister) on the required technical positioning, so that she could position the patient correctly, in the absence of any outsiders.
- Monitoring the positioning remotely from behind the glass of the examination control panel.
- Capturing the radiographic image as soon as the required positioning was achieved.

2.4 Ethical considerations

In documenting and presenting this case, the ethical principles governing the writing of clinical case reports were observed, foremost among which was the protection of the patient's identity; all direct or indirect identifying details that might lead to her identification (such as

her name and the exact date) were omitted, and the presentation has been limited to the clinical and behavioural data necessary for scientific and educational documentation purposes only.

2.5 Limitations of the Methodology

In the interests of scientific integrity, this study acknowledges a number of methodological limitations inherent in the design of an individual case study: the conclusions drawn from it cannot be statistically generalised to all children with autism spectrum disorder, given the uniqueness of each case in terms of the severity of the disorder and the level of sensory and communicative impairments, although the procedural strategy adopted (simplifying the assessment environment and minimising the number of unfamiliar people) may prove more effective and yield faster results when applied in the same manner across different cases and severity levels; furthermore, as with other similar cases, data collection relied on field observation rather than standardised quantitative tools (such as standardised sensory sensitivity scales), which makes it susceptible, albeit partially, to subjective interpretation by the examiner conducting the documentation, whilst allowing for some variation between cases in terms of the severity of behaviour, for example. Nevertheless, these limitations are to be expected and are inherent to the nature of this type of research design; they do not detract from its generative value in proposing hypotheses and practices that can be tested in subsequent, larger-scale studies.

3. Results

3.1 The patient's reactions and observed behaviours

As soon as the patient entered the radiology examination room, it was noted that her anxiety increased and she clung tightly to her sister. The accompanying person confirmed that the patient has an autism spectrum disorder, a condition that is still not sufficiently understood by many medical imaging technicians. The patient exhibited a range of behavioural manifestations typical of such contexts, most notably:

- Refusal to approach strangers (the examiner).
- A clear sense of danger in an unfamiliar setting.
- Hypersensitivity to the sounds emitted by the imaging equipment and the harsh lighting.
- Resistance to assuming the examination position requested by the examiner, despite repeated attempts to reassure the patient.

3.2 Examination outcome

The procedural strategy employed resulted in a fully diagnostic chest X-ray, although it appeared slightly tilted compared with the standard reference position.

3.3 Overall study findings

- A diagnostic chest X-ray was successfully obtained, despite a slight deviation in position compared with the standard reference image.
- The examination required a procedural protocol that differed somewhat from that used with ordinary patients, as well as additional time exceeding the standard duration of the examination.
- The fact that the examiner was positioned outside the patient's field of vision, and the involvement of the patient's familiar companion, were the decisive factors in successfully completing the examination.

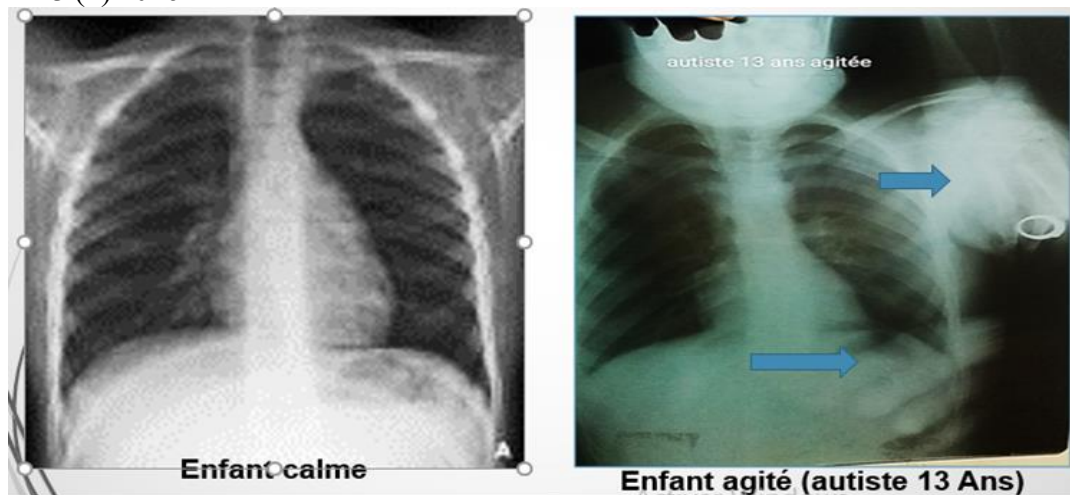


Figure 1. Comparison between a reference chest X-ray of a calm child in the standard position (left), and a chest X-ray of the case under study (a 13-year-old girl with an autism spectrum disorder) during an episode of motor agitation (right), showing a slight deviation in positioning whilst the image remains diagnostically interpretable. (Note: The labels visible within the original image are in French and form part of the original field and real-time documentation of the case.)

4. Discussion

4.1 Reasons for the subject's refusal to approach and to remain in the examination position

The subject's initial refusal to approach the examiner and to comply with the examination position can be explained in the light of one of the central characteristics of autism spectrum disorder, namely the difficulty in interacting with strangers and a sense of danger in unfamiliar contexts and places (Mehdi Zammam, 2008).

This is because the radiology suite combines several elements that are unfamiliar to the subject at the same time: a new location, unfamiliar people, and a behavioural requirement (complete stillness) that is at odds with the child's usual motor and sensory patterns.

4.2 The impact of sensory sensitivity on cooperation

Furthermore, the child displayed a clear aversion to being touched by the examiner whilst she was attempting to guide her into the correct position for the scan, which adds to two other sensory stimuli: Medical imaging equipment emits continuous sounds and uses intense lighting directed directly at the area being examined; these, alongside the refusal to be touched, are sensory stimuli that directly intersect with sensory hypersensitivity, which is a characteristic associated with autism spectrum disorder (Mohand, 2021). Interpreting this behaviour in the light of Dunn's model referred to in the introduction, the patient's response can be classified specifically under the 'Sensory Sensitivity' category: A low neural threshold to sound and light meant that these normally neutral stimuli were perceived as a genuine source of sensory overload, accompanied by a negative response (freezing and clinging) rather than an active response such as escape or explicit refusal (Dunn, 1997) This logically justifies the subsequent success of a strategy to reduce the number of stimuli, in line with Dunn's recommendations that the most appropriate intervention for sensory sensitivity patterns is based on modifying the

environment to reduce the stimulus load, rather than requiring the individual to change their own neural threshold (Dunn, 1997).

The specialist literature on medical imaging supports this explanation; a British survey of 130 MRI specialists concluded that sensory overload caused by the noise of the machine and the constraints of the examination environment represents the most significant challenge faced by patients with autism spectrum disorder during radiological examinations (Stogiannos, Harvey-Lloyd, et al., 2022). Another survey involving 117 medical imaging specialists also showed that hypersensitivity to noise, lighting and physical touch are among the factors that make radiological examinations particularly stressful for this group of patients (Abdelrahman et al., 2024). This sensory overlap explains an important aspect of the anxiety and confusion displayed by the patient upon entering the examination room, as what is considered a neutral stimulus for a neurotypical child may constitute a genuine source of sensory overload for a child with an autism spectrum disorder.

4.3 Factors contributing to the success of the strategy of keeping the examiner out of the patient's field of vision

The success of this strategy is consistent with the findings of a comprehensive systematic review of studies on person-centred adjustments in MRI scans of patients with autism spectrum disorder without the use of sedation, although the characteristic noise levels of MRI scanners make achieving this goal a genuine challenge warranting further field research. This review confirmed that minimising the number of strangers and unnecessary stimuli in the patient's immediate surroundings is one of the most effective strategies for securing their cooperation during the scan (Stogiannos, Carlier, et al., 2022). Furthermore, a recent systematic review encompassing 144 studies on procedural support for children with neurodevelopmental needs during medical examinations confirms that environmental preparation and adaptation strategies (such as reducing lighting, noise and the number of people present) are the most commonly used and most strongly associated with patient and family satisfaction, particularly in radiology and diagnostic imaging examinations (Takashima et al., 2026). By removing the examiner—as a direct source of unfamiliarity—and leaving the patient with a familiar figure (the nurse), it was possible to eliminate a major source of stress, thereby allowing for sufficient physical relaxation to enable the capture of a diagnostically viable image.

4.4 The role of the accompanying person

The study demonstrated the pivotal role played by a familiar accompanying person, whether as a source of emotional reassurance or as a facilitator who conveys the examiner's instructions to the child in a way that the child can understand and accept. This justifies the practical recommendation to systematically involve parents or carers in preparing this group for medical examination situations.

4.5 Consistency of the findings with previous literature

The findings of this case align with Mohand's (2021) definition and Mahdi Zamam's (2008) review of the characteristics of autism spectrum disorder, in terms of sensory processing difficulties, impaired social interaction, adherence to routine and resistance to change; all of which were clearly evident in the patient's behaviour during the examination. These findings also align with the general challenges associated with adapting health services to the

specificities of autism spectrum disorder; the Autistic SPACE framework places predictability and sensory needs at the heart of any successful intervention within healthcare settings (Doherty et al., 2023), which was effectively achieved in this case by simplifying the situation and minimising the number of unfamiliar personnel involved. Furthermore, the findings of this study are consistent with the body of survey research in the field of medical imaging, which consistently highlights the limited specialist training of medical imaging professionals regarding this population, despite growing awareness of its importance (Abdelrahman et al., 2024; Stogiannos, Harvey-Lloyd, et al., 2022).

4.6 Lessons Learned

- The need to provide specialized training for medical imaging staff on the specific characteristics of autism spectrum disorder.
- The importance of creating an examination environment (minimizing unnecessary lighting and noise outside the scope of the equipment's operation; note that equipment noise and direct lighting are often technically unadjustable, which necessitates compensating for this by preparing the patient psychologically in advance and limiting the number of strangers present) before receiving this group of patients.
- The effectiveness of simple, direct verbal and visual communication with the patient, without overwhelming them with complex instructions.
- The pivotal role of involving parents or a familiar companion in carrying out the examination instructions.
- The need to minimize unnecessary sensory stimuli during the examination whenever technically feasible.
- The importance of the examiner's flexibility and quick thinking in adapting the established protocol to the specific circumstances of the case, without compromising the quality standards of the diagnostic image.

4.7 Study Recommendations

- Provide adequate training to staff in radiology departments regarding the specific characteristics of autism spectrum disorder to facilitate the examination process.
- Organize awareness or training days led by radiologists working in healthcare facilities with radiology departments, focusing on what autism spectrum disorder is and its communication and behavioral characteristics, including through informational brochures and posters.
- Incorporate a specialized module on examination protocols for individuals with special needs into paramedical training programs (radiology/medical imaging), with a detailed focus on each disorder and its specific characteristics, particularly the principles of conducting radiological examinations for individuals with autism spectrum disorder.
- Require medical imaging specialists to undergo academic training that enables them to recognize various disorders affecting individuals with special needs and to adapt examination procedures to the specific needs of each case.
- Equipping radiology departments and other medical departments with augmentative and alternative communication (AAC) tools to facilitate explaining the examination process to patients who require it.

- Establishing formal coordination between the health sector and higher education by integrating professors specializing in speech language pathology into paramedical training programs.
- Raise awareness among caregivers of children with autism spectrum disorder regarding the need to inform medical imaging technicians and healthcare workers in general about the child's condition in advance, thereby allowing the examiner to prepare adequately and conduct the examination under optimal conditions.

4.8 Limitations of the Study

- The findings are limited to a single case, which restricts their generalizability to all children with autism spectrum disorder; the severity of the disorder and its sensory and behavioral manifestations vary greatly from one case to another according to the three levels defined by the DSM-5.
- The documentation relied on real-time field observations without the use of standardized measurement tools for sensory sensitivity (such as the Sensory Profile), making the classification of the subject's response within the Dunn model a subsequent theoretical inference rather than a direct measurement.
- No follow-up was conducted to assess the impact of this experience on the patient's or her family's readiness for future radiological examinations, as recommended by the CARE guidelines under the "Follow-up and Outcomes" section (Gagnier et al., 2013).
- Data sources were limited to the examiner and the accompanying nurse, without the possibility of gathering the patient's own perspective due to the nature of her nonverbal communication, and without the involvement of a speech-language pathologist or psychologist who had previously followed the patient's case, if any.

5. Conclusion

Through a meticulous and systematic documentation of a real-world field experience, this study highlights that the success of radiological examinations in a child with autism spectrum disorder does not necessarily depend on the availability of advanced equipment or complex procedural protocols, but is rather closely linked to a thorough understanding of the specific characteristics of this disorder, and the medical team's ability to adapt the examination environment and approach to the case in a simple yet effective manner, grounded theoretically in established frameworks such as Dunn's model of sensory information (Dunn, 1997) and the Autistic SPACE framework (Doherty et al., 2023). These two frameworks have demonstrated clear explanatory and practical value in interpreting the patient's behavior and guiding the procedural intervention employed.

The scientific value of this study lies not so much in the volume of quantitative data or the rigor of the statistical analyses, but rather in the clarity of the formulation of the clinical problem at hand, the accuracy of the systematic documentation of the case in accordance with the CARE guidelines (Gagnier et al., 2013) and its ability to link real-time field observations to specialized theoretical and applied literature, leading to practical recommendations that can be immediately applied in daily clinical practice within medical imaging departments and helping to bridge a genuine documentation gap in the Arab context—and specifically in Algeria—in this field.

Despite the methodological limitations inherent in the design of a single-case study, these findings carry significant implications at both the academic and institutional levels; On the one hand, they call for the integration of specialized modules on working with individuals with special needs in general—and those with autism spectrum disorder in particular—into paramedical training programs, as well as enhanced coordination between the health and higher education sectors to ensure that paramedical staff play a key role in raising awareness and preparing patients for such examinations; On the other hand, it calls for opening up broader research horizons that address the experiences of medical imaging professionals working with this population through larger samples and standardized measurement tools, thereby moving beyond the limitations of individual cases toward the development of unified, evidence-based screening protocols that can be generalized and widely implemented institutionally.

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