What can be improved in learning to care for people with autism? A qualitative study based on clinical nursing simulation

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ABSTRACT

Aim/objective: The aim of this study was to identify the main patterns of errors that 4th year nursing students made in simulated clinical practice with scenarios of care for people with Autism Spectrum Disorder (ASD).
Background: Clinical simulation currently plays a major role in the training of nursing students and provides the participants with the opportunity to practice and develop their clinical sills with a pediatric patient diagnosed with ASD.
Design: A retrospective longitudinal qualitative study was performed.
Methods: Content analysis of the existing debriefing records from a period of 7 academic years (2016–2022) was carried out. The scenario was simulated by a standardized patient diagnosed with ASD, with 23 groups of nursing students.
Results: The results showed different patterns of errors. These patterns were grouped into 1 main category (weaknesses) and 5 major subcategories: clinical, communication, knowledge about ASD, emotions, and behavior towards parents. The most repeated errors were excessive use of verbal communication, abundant stimuli, low demand for information from primary caregivers, low demand for information about the child's emotions and interests, and a lack of knowledge of the profile of the child with ASD.
Conclusion: From the findings of this study, we can highlight the lack of training that students received on the practical approach for providing care to these individuals. It has also been inferred in this study that clinical simulation is a tool that favors reflection and experiential learning for students when they are faced with caring for people with ASD.

1. Introduction

Autism Spectrum Disorder (ASD) is presently one of the most common and heterogeneous disorders in neurodevelopment (Sharma et al., 2018; Lord et al., 2018). This disorder is characterized by a deficit in social, communication, and social interaction skills, and is determined by specific repetitive or restrictive behaviors. Individuals with ASD have a greater probability of developing different clinical, autoimmune, cardiovascular, neurologic, and gastrointestinal problems (Walsh et al., 2021). Thus, it is fundamental for nurses to be prepared to adequately care for autistic individuals, especially children. Children who are treated early have more probabilities of having a better quality of life than those who do not receive treatment. Early intervention improves

health results in the long term (Landa, 2018). These interventions greatly depend on the preparation of healthcare professionals on the management and care of individuals with ASD.

In the past few years, an increased interest has been observed in health professionals for the care of individuals with ASD (McMahon et al., 2020). To improve the care of these individuals, one of the ways is to become updated or to receive adequate training from the start of the university education of health professionals. A type of training that is frequently used at universities is clinical simulation. Education and training based on simulation has a long history in the area of healthcare (Mitchell et al., 2020), and has become an essential part in the learning of nursing. (Warren et al., 2016). It is a dynamic process in which a specific situation is recreated in a safe environment, to afterwards reflect

on the strengths and weaknesses of the participants through a structured debriefing session (Lee et al., 2020). Also, practical and theoretical learning is integrated to improve the professional practice without putting the patients at risk.

Simulation-based learning allows the participants to acquire different skills and improve their critical thinking, and also favors the resolution of problems and decision making when working with a standardized patient (Burrell et al., 2021). The International Nursing Association for Clinical Simulation and Learning (Sittner et al., 2015) defines a standardized patient as an individual who is specifically trained to represent a patient or person with a particular condition or behavior in a manner that is the most realistic as possible. According to Jolly (2015), training health professionals with clinical simulations that allow them to improve their skills and work on correcting errors, can improve clinical practice, and can offer patients a better hospital stay that is less stressful and safer.

In previous studies such as the one by Mclntosh et al., (2018) data on different clinical simulations with ASD patients was analyzed. Nursing students participated in a clinical simulation with a standardized patient who represented an individual with this disorder. In general terms, it was verified that the simulation provided the participants with the opportunity to practice and develop their clinical sills with a pediatric patient diagnosed with autism spectrum disorder.

The interest for the autism spectrum disorder has continually increased over the years due to the greater number of individuals diagnosed with it (Gardner et al., 2016). However, it is very important to highlight the scarce training and education received and demonstrated by nurses during their undergraduate studies. Gardner et al. (2016) suggested that nurses in clinical practice remember a very limited exposure to information on ASD during their formative stage, and little or no effective clinical exposure with patients with this disorder. Also, they recognized having a very low competence on their care and little information on the behavioral patterns they exhibit. Lastly, previous studies have reported that nurses do not feel prepared for providing care to individuals with autism spectrum disorder in normal clinical environments (Cashin et al., 2021).

The Catholic University of Murcia (Spain) has been training nursing students in the care of ASD patients for more than six years. This is done fundamentally with clinical simulation, although the students also receive theoretical information in psychosocial and mental health subjects. Students work with a standardized patient and utilize their knowledge and skills, to be able to solve a simulated clinical scenario. Afterwards, a structured debriefing session takes place, for the evaluation of the actions (behavioral component), emotions (emotional component), as well as the ideas and mental models (cognitive component) of the participants. The debriefing stage is the analytical phase, where the participants, guided by a facilitator, talk about the actions that were correct (Plus), and those that could be improved (Delta), in order to reflect upon and acquire new skills that could be utilized by the students when they start their profession, to offer the best practices in the care of individuals with ASD. The topics discussed in the analytical phase tend to be the most important, and form the basis of what the students take home as the seed of learning (Díaz-Agea et al., 2022).

The rationale for error-based learning has been discussed on numerous occasions and is supported by impactful papers such as "To err is human" (Institute of Medicine (US) Committee on Quality of Health Care in America, 2000) or some patient safety literature that emphasises reflective learning about what can be improved in healthcare (Stelfox et al., 2006). Previous papers have highlighted the need to place the error of everyday practice as a source of learning in nursing (Meurier et al., 1997; Wahl et al., 2022) up to the proposal of a learning-oriented error culture (Gartmeier et al., 2017). It is for this reason that we focus on the perspective of error-oriented learning, and not on punitive management but on reflective management of aspects of care practice that can be improved (Prilla et al., 2013).

The objective of the study was to discover and detect the main patterns of errors committed by 4th, year nursing degree students during the clinical simulation sessions with scenarios of caring for individuals with autism spectrum disorder. The study was centered on the detection of weaknesses to improve the competences of students in caring for ASD individuals.

2. Method

2.1. Study design

A retrospective, longitudinal, qualitative study was conducted, with content analysis of the existing debriefing records from 7 academic years (2016–2022) corresponding to the 4th year Practicum V course in the nursing degree. The records referred to a simulation scenario with a standardized patient diagnosed with ASD, with 23 different groups of students, for a total of 345 participants. Students received theoretical information about autism in the subjects "Psychosocial Care" (2nd degree) and "Mental Health Nursing" (3rd degree). They did not receive practical training on ASD in a systematic way until the simulations of 4th degree, except those students who, in their internship rotation, had the opportunity to spend a period in a center specialised in autism.

2.2. Data collection procedure

The structured debriefings were conducted following the phases recommended for adequate reflective learning (reaction, analytical and summary phase) (Dieckmann et al., 2009; Lee et al., 2020; Phrampus and O'Donnell, 2013). In the reaction phase, participants expressed how they felt in the scenario and described their behavior. In the analytical phase the participants' strengths and weaknesses (plus/delta) were evaluated and they came to reflect on the reason for their behaviors (Cheng et al., 2021). In the summary phase, the participants and the facilitator summarised the most important points and which learning elements they "took home".

The plus/delta records generated after the debriefing of the scenarios were utilized, which the facilitator recorded in a notebook after obtaining the opinions from the participants, the observers, and his own. The role of the facilitator in a simulation group is very important, as he guides the group towards reaching the learning objectives, moderates the discussion, and favors reflection during the debriefing phase, once the simulation has ended. In this case, the facilitator also recorded all the aspects analyzed in each of the analytical phases of the debriefings, which implied the consensus of all the participants in the learning experience.

The facilitator was the professor with the most experience in the management of clinical simulation groups from the Faculty of Nursing. He was qualified by the university to teach about autism, given his education in psychology, nursing, and anthropology. Finally, the records collected the consensus from the group discussion centered on the case. These records were handwritten templates with the format Plus/Delta. In total, 23 records were analyzed from the 2016–2017 to the 2021–2022 academic years.

The purpose of the records is to have a written account of the analytical phase of the debriefing, and to focus the discussion and reflect on the correct (Plus) aspects and those that could be corrected (Delta). It has been observed that the record of the analytical phase facilitates critical thinking and improves the learning strategies of the students (Escribano-Sánchez et al., 2021).

2.3. Design and development of the clinical scenario

The design of the scenario was conducted based on the competence needs of the 4th-year students and had content validity. The scenario was designed through the consensus of the simulation teaching staff from the Clinical Practicum V, and following the guidelines for the design of scenarios recommended by the literature (Maestre et al., 2013;

Raurell et al., 2020). In addition, we followed the guidelines of the International Nursing Association for Clinical Simulation and Learning for the design of the scenario with regard to the clarification of learning objectives and simulation design ("INACSL Standards of Best Practice", 2016).

The same scenario was reproduced throughout the different academic years with no variations of relevance to learning. The clinical course of the scenario was developed in Primary Care, where a mother went with her 11-year-old daughter (diagnosed with ASD) to receive a vaccine, so that it implied an unknown and potentially painful procedure (Fig. 1). Both the mother and the daughter were previously trained students. For the preparation of the standardised patients, previous meetings were held in which the actors received information about the behaviors expected of them according to the scenario script and the possible responses of the students. For the training of the standardised patients, the recommendations of the literature (Andrea and Kotowski, 2017; Laughey et al., 2019) were followed and it was insisted that they should maintain confidentiality and not transmit information to the rest of the students, as well as not overact. The use of students as standardised patients has been described in the literature (Keiser and Turkelson, 2017) as an appropriate method in the context of simulation learning.

The child did not want to collaborate, and the mother was nervous. In every case, the students were expected to manage the situation and to be able to administer the vaccine without it being traumatic for the child, with effective communication and by resolving any doubts from the mother. The summary of initial data from the scenario (Briefing) and the clinical course are shown in Table 1).

2.4. Data analysis

To analyse the data obtained from the debriefing logs (in the analytical phase), all the summaries of what the participants, observers and facilitator considered by consensus as "pluses" (things that went well) and "deltas" (things that could be improved), following in-depth discussion of the behaviors of the students who experienced the simulated situation, were compiled. In addition, a technique of deep reflection in the analytical phase of the debriefing was followed. We refer to the "good judgment"(Rudolph et al., 2006, 2007) debriefing, in which the participants' erroneous mental models were analysed by inferring these from their manifest behaviors.

These summaries were handwritten in the notebooks that were used by the facilitator to keep track of the relevant aspects of learning for each group of students. This information was transcribed and transferred to a Microsoft Word format for analysis. The content analysis was conducted with an inductive orientation and inspired by the Grounded Theory method (Glaser and Strauss, 2017), which supports the theoretical conclusions of qualitative research in the direct interpretation of the

Fig. 1. Image of the recording of a scenario of caring for a child with ASD, corresponding to the 2020–21 course.

Table 1
Initial data from the scenario and the clinical course.

BRIEFING (Information provided to the participants)	CLINICAL COURSE (Script for instructors and actors/patients). The actors are students who had been previously trained for the simulated case.
S (Situation): You are a team of Primary Care nurses (vaccinations and pediatric examination). Your patient is an 11-year-old child who goes to the center with her mother (by appointment) to get the meningitis vaccine. **B (Background)** 11-year-old girl diagnosed with ASD level 2 (DSM V) since she was 4 years-old No allergies. No siblings **A (Assessment).** **Social Communication**: A person who communicates with simple phrases, whose interaction is limited to specific, special interests, and uses a very eccentric non-verbal communication. **Behavior**: The inflexible behavior, the difficulty in dealing with changes, or other restricted/repetitive behavior clearly appear frequently to the casual observer and interfere with normal functioning in diverse contexts. Anxiety and/or difficulty in changing focus. **R: Recommendation:** Manage communication in an effective manner (Establish communication strategies). Explain the procedure clearly and concisely. Resolve the mother's doubts. Calm the mother and child. Administer the vaccine in the less traumatic manner possible. Identify problems that are common to individuals with ASD that the child may have.	Sequence of events of the clinical scenario (Itemized script) 1. The patient, accompanied by her mother, is in the waiting room waiting for the arrival of the nurses. They will have to explain to her the reason for the visit and what they will do (ideally, they would explain what they will do using a notebook that explains what will occur at that moment through images), to avoid an overload of verbal stimulations. 2. While the procedure is explained, the child will start to become nervous and to say that she does not want it, that she is afraid. Then, the nurses will try calm her down until they succeed, to obtain her approval. 3. The nurses leave to prepare the equipment/material needed to administer the vaccine, and when try to inject, the patient will become nervous, showing stereotypy, while the mother will also become nervous as she sees the situation unfolding, interfering with the nurse's work. 4. From this moment on, the nurses will have to demonstrate their ability to control the situation and recognize these types of disorders until the child freely lets the nurses administer the vaccine (this will only occur if the nurses control the situation). 5. If the nurses cannot control the situation, the patient will become increasingly nervous until the nurses show the correct behavior or if they have to leave without administering the vaccine.

data coming from the social reality under investigation.

The debriefing logs were kept by the facilitator, who took into account the views of the participants, the observers and himself. This record reflected the group's consensus on the strengths and weaknesses of the participants in the form of short sentences or words that are worked on reflectively at this point in the debriefing. Graphic recordings made during debriefing have been shown to improve concept fixation, motivation and critical thinking compared to simply discussing topics without recordings (Sánchez et al., 2021). To avoid bias from a single observer, the record contained the group's consensus on the situation experienced.

In first place, all the handwritten information was transcribed to an editable format (Microsoft Word®). Afterwards, a content analysis was performed from these literal transcriptions. Once the data had been transcribed, two different members of the research team (with extensive experience in qualitative research, one with a PhD in Psychology and the other with a PhD in Social Anthropology) read the data independently. The researchers always tried to maintain a reflexive attitude in order to minimise the impact of their subjectivity on the data collection and analysis process. To codify the information, units of meaning were categorized that served to find patterns and interpret the data (Hsieh and Shannon, 2005). These units of meaning were named categories and subcategories. This analysis was performed, as it is usually done in qualitative research using the Grounded Theory approach, in an

inductive manner (from the specific to the general). The behaviors of the students during the simulations throughout the 6 academic years were categorized/codified considering the frequency of repetition and/or similarity in meaning. In this manner, we identified patterns of conduct of the students who took part in the simulation scenario. Only the "delta" behaviors were analyzed, given the volume of data and the objective of the study.

2.5. Ethical considerations

As this was a retrospective documentary analysis, in which work was not performed with a sample of participants, but with documents resulting from didactic evaluations, there was no need for the approval from an Ethics Committee for the work, as recommended by the APA in its ethical principles (APA, 2002). Nevertheless, no rights were violated, and no data appeared that could compromise the privacy and safety of any student. The university degree students, when starting their simulation practices, sign an informed consent form related with the recording and use of the data for teaching or research objectives.

3. Results

Of the 345 participants (all 4th year nursing students), 263 were female (76%) and 82 male (24%), with a mean age of 24.6 (SD 4.6). The patterns identified and placed into groups according to their meaning and frequency of repetition could be grouped into a category and five subcategories (Fig. 2).

The most frequents "Delta" were the excessive use of verbal communication, the environmental overload, the abundant stimuli, the scarce demand for information from the main caregivers, and the scarce information requested about the emotions and interests of the child, and the lack of knowledge about the general profile of a child with ASD (Table 2).

3.1. Clinical weaknesses

Some students did not ask about allergies before administering the vaccine to the child. Various cases were also observed of deficiency in asepsis when administering the vaccine. In some cases, the students resorted to forcibly holding the minor to administer the vaccine, when persuasion did not work. In most of the cases, cognitive distraction techniques were not used to avoid the forced administration of the injection. Another important clinical weakness was that a prior physical evaluation of the patient was not performed before administering the vaccine.

3.2. Communication

A preponderance of verbal versus non-verbal communication was found in the delta records. The facilitator recorded as "delta" behaviors in the students, such as talking to the patient to explain the technique using only verbalisations without explicit support of gestures, images or pictograms and at a fast pace, not adapted to the needs of the patient with ASD. The pattern of the students speaking at the same time to the simulated patient was frequently repeated, without them being aware of personal space or the height in which they were positioned. Many students speaking at the same time could make the scenario, in most cases, to be very noisy and with abundant stimuli for the patient.

3.3. Knowledge

One of the most recurrent "delta" aspects was the lack of knowledge about the profile of individuals with ASD. The large presence of an elevated number of stimuli, and the scarce interest of the students for decreasing them, pointed to this lack of knowledge. It was also observed that there were students who did not know the usefulness of pictograms, and were not aware of the importance of adapting communication, and
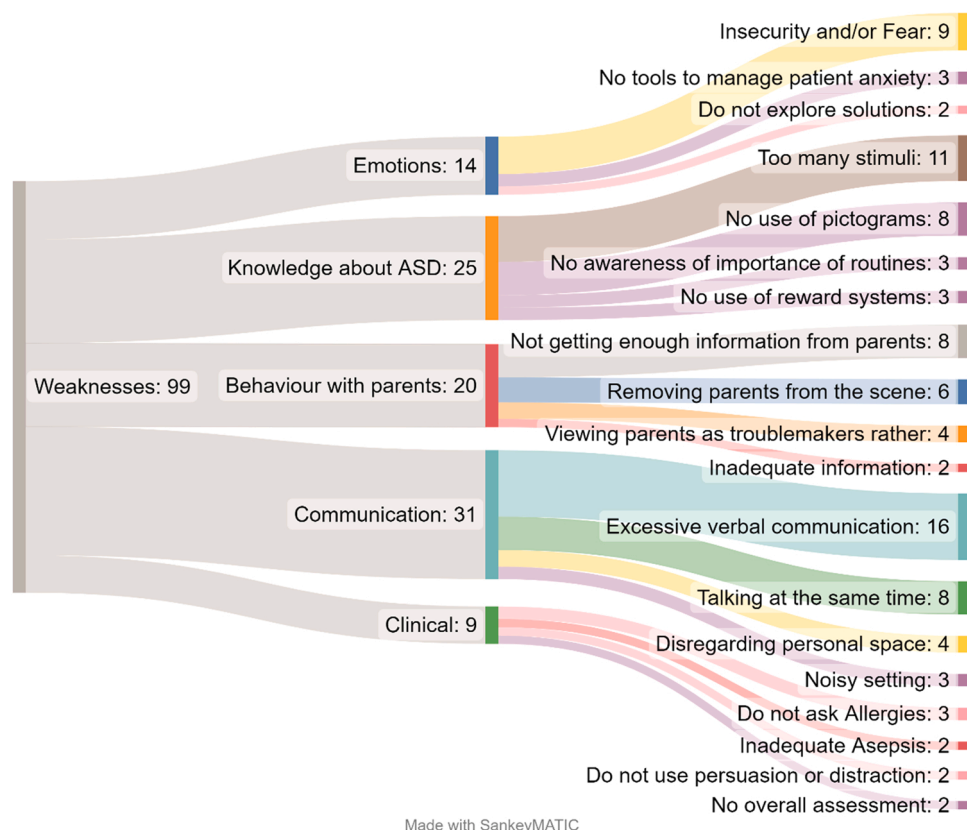

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Fig. 2. Sankey diagram of the category/subcategories obtained after the content analysis.

Table 2
Weaknesses. Categories and subcategories*.

THEME	CATEGORIES	SUBCATEGORIES	Coded Segments	FREQUENCY (%)	FREQUENCY BY CATEGORY (%)
WEAKNESSES	Emotions	Insecurity and/or Fear	9	9.1%	15.2
		No tools to manage patient anxiety	3	3.1%	
		Failure to explore solutions to control patient's negative emotions	2	2%	
	Knowledge about ASD	Too many stimuli	11	11.1%	25.2
		No use of pictograms	8	8.1%	
		No awareness of importance of routines	3	3%	
		No use of reward systems	3	3%	
	Behavior with parents	Not getting enough information from parents	8	8.1%	20.2
		Removing parents from the scene	6	6.1%	
		Viewing parents as troublemakers rather than potential collaborators	4	4%	
		Giving parents inadequate information 2		2%	
	Communication	Excessive verbal communication	16	15.2%	30.3
		Talking at the same time	8	8.1%	
		Disregarding personal space	4	4%	
		Noisy setting	3	3%	
	Clinical	Do not ask Allergies	3	3.1%	9.1
		Inadequate Asepsis	2	2%	
		Do not use persuasion or distraction	2	2%	
		No overall assessment	2	2%	
		TOTAL	99	100.00	100.00

* Coded segments: The segments found in the transcripts are counted. Each coded segment means that there is some annotation in the facilitator's notebook that referred to the emergent category or subcategory analysed. Frequency: refers to the percentage that the theme represents in the total number of coded elements in the transcripts (data are displayed according to category/subcategory).

the adequate management of personal space. They also did not enquire about the type of routines that were habitual for these patients, or how to integrate these routines in the context of the scenario to improve their well-being and collaboration. In general, they did not use reward systems to facilitate the administration of the vaccine.

3.4. Emotions

The students, on many occasions, showed insecurity and fear against the situation. From the point of view of the patient, the students did not perform actions that could control certain negative emotions in the child, such as frustration or nervousness. They also did not explore the emotions of the patient and did not ask the parents for information about how they managed an uncontrolled emotional situation of their daughter.

3.5. Parent's behavior

As for the family, they showed a lack of interest in some cases, without obtaining prior information on the child's disorder from the parents, her tastes, interests, preferences, and ways to communicate with her.

On some occasions, they removed the mother from the scene, to try to reduce her stress, or because they considered the mother as a disruptive element instead of a collaborator. On other occasions, some students provided information on the diagnosis without exactly knowing about the information possessed by the parents, alarming them, and a student also dared to directly diagnose the patient with labels such as hyperactive or autistic.

4. Discussion

Considering the findings from this study, it can be stated that some students have learning gaps with respect to caring for individuals with ASD. We could think that these weaknesses are derived from a study plan that did not consider this type of care in depth. Nevertheless, in following simulations, the weaknesses found were discussed and solved, making the students reflect on their actions and consequences.

Although the strengths of the trainees have not been presented and

discussed in this article, but only the weaknesses, we can affirm that there is work to be done in terms of practical training in the management of autistic paediatric patients. Obviously, there were numerous successes and not all groups of students made the same mistakes in the simulation scenario. The aim of this work was to systematise and identify the most frequent errors in order to improve the learning of our students. The literature on the subject has shown that that during their clinical practice, nurses remember a limited exposure to information about ASD during their formative years, and little or no effective clinical exposure with patients who had this disorder (Gardner et al., 2016). This makes necessary the inclusion of some basic aspects about individuals with ASD in the undergraduate, graduate, and continuous training education plans (Keklik and Nazik, 2021). However, perhaps the change from a traditional teaching methodology to one that is experiential and reflective, such as simulation, provides an answer to this need. Autism has shifted from being an infrequent and little known disorder to being investigated in depth, so that the training of students and professionals should not decrease (Mintz, 2017). In our study, we verified that nurses must enquire about the resources needed to provide recommendations to the parents of children with ASD, for their comprehensive care and attention, which should also include education-related recommendations (Johnson et al., 2012).

Another interesting finding was the little consideration of the students on the interruption of the routines implied by going to a medical consultation. In general, they were not interested in the habitual routines of the children with ASD who went to their consultation. It is known that children with ASD feel safer and more stable when following certain routines (Chebuhar et al., 2013). For them, the routine is a comforting mechanism, but during their stays in health centers, these are usually interrupted. Although it could be impossible for patients to follow their routines at the hospital, everything possible must be made to maintain it. Scarpinato et al. (2010) recommends maintaining the food intake schedule, the basic activities of daily life, and playtime to decrease the levels of anxiety and agitation, for the patient and the family as well.

Another study finding was the scarce use of reward systems to ease the administration of the treatment to simulated patients. When the evaluation, observation, and administration of a treatment is complicated, rewards systems can be utilized. Many of these individuals

respond well to these systems. During their stay in a medical center, the patients experience situations that are new and unknown to them, which can result in the appearance of difficult, aggressive, and challenging behaviors, aside from negative emotional reactions such as frustration and agitation. This is when the use of reward systems is recommended, for example, when administering medicine, and especially with painful procedures. The patients cannot understand why this medication is being administered and may have the feeling of being the object of an unpleasant procedure. Establishing a reward can be a positive re-enforcement that could condition the next time the patient is subjected to the same treatment, so that less agitation occurs (Lord et al., 2018).

Another aspect that must be highlighted from our findings is the high sensorial overload produced during the simulated scenarios. Many people speaking at the same time, raising their voices, or the presence of too many stimuli, were found to be frequent actions considered as weaknesses in the debriefing records. During the hospital stay of patients with ASD, we must pay special attention to the stimuli experienced by the child, as these individuals are characterized by a sensorial overload (Duerden et al., 2012). Nurses must work alongside the family to learn how to identify if the patient is agitated due to the noise, tact, sound, smells, tastes, or foods that are provided during the stay. Each patient must be treated as unique, so that these or other factors must be identified in each of them. According to Jolly (2015), a recommendation is made to maintain the lights low, decrease the levels of noise in room they are in and the areas surrounding them, aside from decreasing stimulation.

We also observed a scarce lack of interest from our students in adapting communication to the patients. In general, a clear method of communication must be established with the child. These individuals, generally, tend to be concrete thinkers, and most use brief and not very receptive communication. It is very important to identify the most correct manner to relate to them (Duerden et al., 2012), and to discover if there is some type of limitation to communicate, as this increases frustration. To achieve adequate communication, our students should have involved the family, as they are the ones who know best how to communicate positively with the child.

Another aspect relative to the communication errors between the students in simulated environments, was not considering that for autistic individuals, visual and non-verbal communication has a greater weight as compared to a verbal one, with students also not being careful to not invade the personal space of the patient. When speaking about special care in verbal communication, we refer to the health professional approaching the patient individually and not as a group. Also, only a single person should speak in a paused and clear manner, as it will be more beneficial for communicating with the patient. Most of the pediatric patients who have ASD respond better to short and brief orders (Scarpinato et al., 2010). It is preferable for the nurses to approach individually in a calm and non-threatening manner. In some scenarios, the students approached the patient as a group, which can lead to anxiety or aggressive behaviors in autistic children (Johnson et al., 2012).

The knowledge about the autism spectrum demonstrated by our students was scarce. In general, university training tends to be not sufficient to address nursing care of individuals with ASD (Gardner et al., 2016; Patton & Lewallen, 2015).

Another action that was frequently omitted by our students was to enquire about the specific worries and emotions of the child. This is important, as certain actions could be avoided that may result in the patient having aggressive or self-destructive behaviors (Johnson et al., 2012). On many occasions, the frustration shown was due to the difficulties in communicating with their nearest environment, such as family members, to the changes experienced at that moment, or to the over stimulation at that specific time (Duerden et al., 2012).

In the present study, it was also observed that students did not interact enough with the parents, so that they wasted a beneficial resource for the management of the simulated situation. On many occasions, the needs of the parents were unnoticed by the students. The family must be involved, and their participation must be fomented from the start, as parents can provide information to the nurse about what the best method is for approaching the patient. The family is the best ally for the healthcare team (Lokhandwala et al., 2012). According to (Hyman and Johnson, 2012), the families of patients with ASD often refer to not being heard. It is very frequent to find exhaustion, depression, frustration, and bad health in these families. The responsibility of the health professional is not only to the patient, as the family must also be looked after. Active listening must be maintained, the worries expressed by the family must be recognized, and these must be effectively dealt with by the health professionals (Giarelli and Gardner, 2012).

4.1. Limitations

One of the limitations we found in the present work was that the students did not deal with a real-life situation. Therefore, there is a possibility that the data from the present study could vary if the situations evaluated were real. Nevertheless, the fact that this is a simulation study implies that the ethical conditions are more defensible and less controversial (not exposing real patients or their families to any experimental condition).

On the other hand, the documents subjected to analysis came from the records from a sole facilitator, who recorded the observations from all the student groups and his own throughout a period encompassing various academic years. Perhaps obtaining the records from other facilitators could have enriched the study.

It is important to comment that the analysis of only the "delta" behaviors could lead to a false feeling that the learning of the students was based on the correction of errors, and this is not true. In the analytical phase of the debriefing, the successes and strengths are worked on first, which were many, but not the object of study. Not all the students had a low performance, and in this study, we only focused on the aspects that could be improved, which provides us with a broad view of how to focus the training, both theoretical and practical, of future professionals.

The external validity of the study is limited, as data were collected from a single university center and the conclusions of this study cannot be extrapolated to the reality of all nursing students.

5. Conclusion

The main weaknesses of 4th year nursing students when providing care to autistic individuals in simulated environments were classified into 5 sub-categories, which were the management of emotions, lack of knowledge about ASD, specific clinical errors, communication, and behavior towards the main caregivers. The most frequent aspect that could be improved were the excessive use of verbal communication, the abundant stimuli, the scarce demand for information from the main caregivers, the scarce information requested about the emotions and interests of the simulated patient, and the lack of knowledge about the profile of children with ASD.

A long road must still be traveled in the learning of health professionals about the autism spectrum disorder, and the training in therapeutic skills in the nursing degree. We are convinced that simulation training has a positive impact on the care of individuals with ASD and their families.

CRediT authorship contribution statement

José Luis Díaz-Agea: Conceptualization, Methodology, Data curation, Formal analysis, Investigation, Software, Supervision, Validation,

Writing – original draft. **Natalia Macías-Martínez:** Data curation, Methodology, Investigation, Writing – original draft preparation. **César Leal-Costa:** Conceptualization, Methodology, Data curation, Formal analysis, Investigation, Software, Supervision, Validation, Writing – original draft. **Gema Girón-Poves:** Conceptualization, Methodology, Software, Investigation, Supervision, Validation, Writing – original draft. **Juan Antonio García-Méndez:** Investigation, Validation, Supervision, Writing – review & editing. **Ismael Jiménez Ruiz:** Methodology, Supervision, Resources, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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