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Recognising and Expressing Emotions: Difficulties of Children with Autism Spectrum Disorder in Learning a Foreign Language and How to Resolve Them

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Recognising emotions, facial expressions and tone of voice and body language, expressing and managing their own emotions, and understanding and responding to other people's emotions are often difficult for children with autism spectrum disorder. Since the emotional codes of individuals with autism spectrum disorder are different, those people will possibly be awkward in expressing some throughout their lives. Although it might seem that children with autism spectrum disorder do not respond emotionally, the ability to understand their facial expressions could lead to an improvement in their social interaction difficulties. In addition, since autistic expressions might be unique to each child, recognising their emotions is important when delivering a personalised intervention to a child with autism spectrum disorder. In recent decades, researchers have become increasingly interested in the role of emotions in learning and teaching a foreign language beyond heavily investigated topics such as foreign language anxiety and motivation and attitudes towards the foreign language. In this paper, how emotions impact the motivation and success of children with autism spectrum disorder while they are learning a foreign language is presented. Challenges, opportunities and future research directions in this domain are given.

Keywords: autism spectrum disorder, emotions, recognition, foreign language

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Prepoznavanje in izražanje čustev: težave otrok z motnjo avtističnega spektra pri učenju tujega jezika in kako jih rešiti

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Prepoznavanje čustev, obrazne mimike in tona glasu ter govorice telesa, izražanje in obvladovanje lastnih čustev ter razumevanje in odzivanje na čustva drugih ljudi so za otroke z motnjo avtističnega spektra pogosto težavni. Ker so čustvene kode posameznikov z motnjo avtističnega spektra drugačne, bodo mogoče ti posamezniki v svojem celotnem življenju okorni pri izražanju nekaterih emocij. Čeprav se mogoče zdi, da se otroci z motnjo avtističnega spektra ne odzivajo čustveno, lahko zmožnost razumevanja njihove obrazne mimike pripelje do izboljšanja njihovih težav pri socialni interakciji. Nadalje, ker so avtistični izrazi lahko edinstveni za vsakega otroka, je prepoznavanje njihovih čustev pomembno pri izvajanju prilagojene intervencije za otroka z motnjo avtističnega spektra. V zadnjih desetletjih se raziskovalci vedno bolj zanimajo za vlogo čustev pri učenju in poučevanju tujega jezika, ne le za močno raziskane teme, kot so: strah pred tujim jezikom ter motivacija in odnos do tujega jezika. V tem prispevku je predstavljeno, kako čustva vplivajo na motivacijo in uspeh otrok z motnjo avtističnega spektra pri učenju tujega jezika. Podani so izzivi, priložnosti in prihodnje raziskovalne usmeritve za to področje.

Ključne besede: motnja avtističnega spektra, čustva, prepoznavanje, tuji jezik

Introduction

People with autism spectrum disorder (ASD) have persistent difficulties in social communication and interaction, including deficits in empathy, facial expression, eye contact and body language, and have a lack of interest or difficulties in making friends and social relationships (American Psychiatric Association, 2013). In addition, they exhibit restricted and/or repetitive patterns of interests, behaviour, or activities, such as fixation on certain topics and insistence on rigid routines.

Moreover, atypical responses to sensory stimuli are a new criterion in DSM-5 for the diagnosis of ASD. Atypical sensory behaviour can be manifested in the form of hyper- or hypo-reactivity to sensory input or unusual sensory interests. For example, some people with ASD are sensitive to noise and have a high pain threshold (Allely, 2013). People with ASD exhibit disorders of various levels in terms of social skills, speech and nonverbal communication, interests, and behaviours. As a result of many genetic and environmental factors, each person with autism has some strong points and challenges. Therefore, while some people with ASD need extensive support in their daily lives, the remaining need less support or even can live independently.

When applying an autism screening test, clinicians examine the children's social and communication behaviours (Randall et al., 2018). Since the test depends on the clinicians' subjective perspectives, further diagnosis is required from a paediatrician, psychiatrist, or other professionals. While a diagnosis of ASD plays a key role in the intervention, making an incorrect diagnosis can make the situation worse (Guthrie et al., 2013). While there were different groupings in the past, nowadays, a single diagnosis with a range of severity is made (American Psychiatric Association, 2013). It was shown that the early, accurate diagnosis of ASD is highly important (Crais & Watson, 2014). Although ASD diagnoses are obvious in some cases, they are ambiguous in others. Therefore, further investigation is required to identify the strengths and weaknesses of the subject (Lockwood Estrin et al., 2021). For instance, genetic and metabolic causes should be searched for in cases of intellectual disability and other behavioural problems (van Karnebeek & Stockler-Ipsiroglu, 2014). The assessment for this typically involves a few or all of the following tests: a physical examination, brain scans, blood tests, a family and developmental history, an assessment of the child's experience of school, an assessment of parenting and family dynamics, psychometric, communication, speech and language testing, and hearing tests (Huerta & Lord, 2012).

Currently used methods such as for clinical diagnosis of ASD are based on clinical judgement and DSM-5 criteria (American Psychiatric Association,

2013) with or without data obtained using diagnostic tools based on behavioural observation such as the Autism Diagnostic Observation Schedule – 2nd edition (ADOS-2) (Lord et al., 2012) and the Childhood Autism Rating Scale – 2nd edition (CARS-2) (Schopler et al., 2010) or diagnostic tools based on parent/caregiver interviews such as the Autism Diagnostic Interview-Revised (ADI-R) (Lord et al., 1994), Social Responsiveness Scale – 2nd edition (SRS-2) (Constantino & Gruber, 2012), Diagnostic Interview for Social and Communication Disorders (DISCO) (Wing et al., 2002), Developmental, or Dimensional and Diagnostic Interview (3di) (Brian et al., 2019). These tools might be deemed subjective, time-consuming, and costly. Therefore, computer-assisted diagnostic techniques proposed for the diagnosis of ASD have received increasing attention in recent years. A common conclusion of most of those studies is that the predictions become stronger when data from both of a child's parents are combined rather than from only one parent (Rahman et al., 2020). As the results of the classification studies realised in this domain prove, when reliable and accurate datasets with sufficient attributes are available, it is possible to predict whether a child has ASD or not by using software-based tools. However, in a clinical setting, independent confirmation of the decision made for each child by an experienced specialist is required (Wingfield et al., 2020). Although early identification and timely treatment of children with ASD considerably improve potential outcomes, specific evidence should be provided to individualise treatment recommendations. If routinely measured in a clinical setting, biomarkers could transform clinical care for diagnosed children (Bridgemohan et al., 2019). When an intervention is applied, positive responses can range from extremely limited to dramatic. This is due to possible moderators of individual responses, including the child's characteristics, symptom severity, and age at the onset of the intervention (Zwaigenbaum et al., 2015). The main reason for this is the fact that ASD is a complex and heterogeneous disorder, clinically, biologically, and etiologically. Therefore, while some individuals with ASD respond to specific interventions quite well, others do not. Given the complexity of the disorder and the fact that symptoms and severity vary, there are probably many causes. This makes it necessary to understand the cause(s) of their disorder in addition to the associated neurobiological mechanisms working in each case (Zwaigenbaum et al., 2015). Some genetic and neurobiological groups are known to be associated with ASD. Children with duplication 15q, fragile X syndrome, and tuberous sclerosis are the most well-known groups (Campbell et al., 2009).

A promising short-term, problem-focused treatment approach for children with ASD who have other mental health conditions, such as anxiety or depression, is cognitive behavioural therapy (Wood et al., 2009). The main idea

behind this approach is to teach children to change how they think about a situation via its cognitive component and then help them change how they react to a situation via its behavioural component. When this approach is applied successfully, the children and their parents acquire skills to cope with difficult situations. Wood et al. (2009) tested a cognitive behavioural therapy based on an evidence-based treatment for children with ASD who also have comorbid anxiety disorders. As a result, the remission of anxiety disorders was achieved in the treatment group.

Emotions can be conveyed through facial expressions, voice, and body movements and positions. Like typically developing children, children with ASD feel emotions and attempt to communicate them to other children around them. Nevertheless, they often have challenges recognising some facial expressions and expressing themselves. Because emotions are sometimes difficult to understand and interpret, it is normal for typically developing children to have some difficulties in understanding and interpreting the emotions transmitted by children with ASD. It was shown that individuals with ASD are often unsuccessful in reacting appropriately to the emotions of others, and impairment in recognising emotional expressions might contribute to these inappropriate reactions (Rump et al., 2009). In addition, individuals with ASD have deficits in social cognition and might be awkward in expressing some emotions throughout their entire lives (Isaksson, 2019). Although neurotypical individuals can pass on emotions through gestures, individuals with ASD often have difficulty verbalising what they are feeling in an appropriate manner. Therefore, enough time should be spent to listen to an individual with ASD and understand what they mean.

If others are able to read their emotions properly and react appropriately, children with ASD will possibly be able to gain more self-confidence and attempt to do their best to develop their emotional language further. In addition, children with ASD generally have difficulty communicating by understanding and imitating the emotional expressions of others; therefore, understanding their own emotions and interpreting them properly are often difficult for them. In many ways, children with ASD recognise different emotions, and some are more difficult to analyse than others. Emotional misunderstandings with typically developing peers create painful experiences and result in trauma in individuals with ASD. Nevertheless, there are a limited number of intervention methodologies to deal with this situation. Robinson (2018) proposed a novel case conceptualisation model for emotion-focused therapy for individuals with ASD and illustrated it with an example. Based on a sequence of emotional processing steps, the proposed model describes the transformation of problematic emotion structures. In this manner, emerging adaptive emotions help a person

understand his/her mental state and those of others, strengthening both intrapersonal and interpersonal agency.

Individuals with ASD are disadvantaged if the general demands of society are considered. As a result, many individuals with ASD have serious difficulty attaining a minimum level of social integration that is a must for acceptable quality of life (Bishop-Fitzpatrick et al., 2015; Ginsberg et al., 2014). The ability to recognise facial expressions of emotion plays a key role in establishing interpersonal connections early in life, because doing so is essential to understanding the intentions and feelings of other individuals (Ekman, 2003).

Emotion Recognition and Expression Difficulties of Children with ASD

When children are diagnosed with ASD, they are diagnosed at a level of 1, 2, or 3, depending on the severity of existing symptoms. Children diagnosed with Level 3 ASD show difficulties with eye contact; therefore, a protocol starting from the basic level must be followed. Eye contact is an essential skill to obtain a person's attention and communicate with someone involved in a conversation or dialogue. However, it alone is not sufficient. Children also need to acquire oral and gestural communication skills. If children complete the protocol correctly, they will explore the next levels. Children diagnosed with Level 2 ASD may already show eye contact skills, but they are still not able to carry out tasks requiring joint attention. Compared to typically developing children, children with ASD show limited joint attention. This is associated with the lack of language and imitation skills indispensable in social communication. Imitating body movements of other individuals requires body imitation ability, but children with ASD also have impairments with this. Compared to typically developing children, children with ASD exhibit non-typical facial activity in response to facial expression stimuli, and they are less reactive to basic facial expressions, such as sadness, happiness, fear, and disgust. Therefore, the therapy is mostly started from one of the joint attention exercise levels. Children diagnosed with Level 1 ASD usually do not need to practice eye contact skills, attention exercises, or body imitation skills. Therefore, the therapy could be directly started with expression exercises to teach to recognise and imitate facial expressions.

From an early age, children with ASD typically demonstrate reduced interest in other people's emotional behaviours and faces (Dawson et al., 2012). The lack of joint attention is one of the most important early indicators of ASD. Due to the lack of joint attention, preschool children with ASD do not often use words to direct the attention of their peers or other individuals. Due to the same

problem, young children with ASD sometimes do not tend to point out interesting things to their peers or other individuals by using eye gaze, sounds, words, or gestures or do not respond to and focus on interesting things pointed out to them.

Children with ASD often have some difficulties in using emotion to understand social interactions. They may not notice and share other people's emotions. In addition, children with ASD may read situations inaccurately and respond with emotions that look awkward. It has been shown that in many social processes, identification of other people's emotions from facial expressions is crucial (Clark et al., 2008). For example, a child with ASD may not show interest in comforting a sibling who falls over or may even laugh. It has been shown that babies later diagnosed with ASD can express feelings almost in the same way as typically developing babies.

Additionally, by school age, children with less severe ASD might express their feelings in a very similar manner to typically developing children, but they have difficulty describing their feelings. In contrast, at the same age, many children with more severe ASD seem to have and demonstrate less emotional expression than typically developing children. For instance, they might become angry very quickly or cannot calm down from strong emotions. Although almost all individuals with ASD have significant impairments in emotion recognition skills to some degree: the older ones seem to have better skills than the younger ones (Kuusikko et al., 2009). Therefore, emotional development in children with ASD should be encouraged, because they can acquire skills in recognising and managing their emotions if they are helped. For instance, everyday interactions could be used to help children with ASD learn about emotions and also improve their ability to express and respond to various emotions.

Deficits in understanding and expressing emotions in facial affect, tone of voice, and body could result in social exclusion, peer rejection, and bullying (Berggren, 2017; Frith & Frith, 2003). Eventually, these negative social experiences might lead to low occupational attainment, poor social relationships, and an elevated risk of psychiatric disorders (Howlin et al., 2004; Taylor & Seltzer, 2011). Moreover, it has been shown that it is difficult for most adolescents with ASD to establish meaningful relationships or romantic relationships later in life (Berggren, 2017; Bishop-Fitzpatrick et al., 2015). A lower degree of self-confidence and self-determination, a higher degree of dependence, and a higher degree of dependence on family are common in individuals with ASD (Wehman et al., 2014).

Although children spend a considerable amount of time at school, most schools lack effective strategies for the inclusion of children with ASD. Therefore, the emotion recognition and processing challenges of children with ASD should

be considered when developing effective inclusion strategies (Berggren, 2017). Due to the difficulties in emotion recognition, children with ASD have significant difficulty interacting. Therefore, they are generally socially isolated and feel alone (White et al., 2007). As a result, if they do not receive appropriate and effective intervention, they have a higher risk of developing secondary psychiatric conditions compared to typically developing children (White et al., 2011).

Difficulties in social skills, including emotion recognition, negatively affect children with ASD in terms of their development and ability to perform at school (Vadnjal & Radoja, 2020). In contrast, strong social skills lead to less internalising and externalising problems in classrooms (Henricsson & Rydell, 2006), and poor social skills are potential risk factors for anxiety and depression (Segrin & Flora, 2000). Therefore, various intervention strategies have been developed to promote the prosocial behaviours of children with ASD. One of the most effective is social skills training, which consists of a broad range of education techniques, including social stories, social problem solving, peer-mediated interventions, video modelling, and scripting procedures (Reichow et al., 2013).

Difficulties that Children with ASD Have in Learning a Foreign Language

Individuals with ASD have significant impairments in social interaction skills. Since they have difficulties in social conversation and frequently feel discomfort around other individuals, they can behave in a rude or offhand social manner (Wire, 2005). They may sometimes want to work in a group or pair but do not have the appropriate skills to do so; therefore, they are disinterested in it, even dislike it, and strongly prefer to be allowed to work alone and independently. As well as these, they have unusual social communication characteristics. Their voices may be too loud or soft, and their speech may be garbled and long-winded or too brief. During their speech, the echoing of phrases and words is experienced by others. Another challenge from the point of view of social communication is that direct eye contact with others is difficult for some individuals with ASD. Therefore, they may focus on a point beyond the face or on the mouth. Children with ASD show diminished responses to social stimuli and gaze cues. Consequently, they are unresponsive to the social signals sent by other individuals. They also have difficulties perceiving the eyes of other individuals as socially salient. Due to this, children with ASD seldom establish eye contact; therefore, they have impairments in social attention and have difficulties in both communication and interaction with other individuals. As a result of this, they have significant social and academic problems.

Moreover, the lack of flexibility, a prominent characteristic of ASD, can be seen in individuals with ASD in varying ways. It is seen in the form of difficulty that most individuals with ASD have when dealing with change. Restricted, repetitive patterns of behaviour, interests, or activities are related to the lack of flexibility. For instance, it is difficult for them to become used to a new subject, new teacher, and new school, which takes considerable time. Since they do not like it if someone varies their routines, warning them in an appropriate form before such a situation could be useful (Wire, 2005). The lack of flexibility is sometimes viewed in the form of a strict appliance of different rules, which sometimes contend with established class rules. For example, some students with ASD do not want anyone else writing in their exercise books or using different colours of pencils, or they want to see that their books and pencils are neatly lined up on their desks. They may become upset if they cannot sit in particular chairs. As a result of these kinds of difficulties, children with ASD may be highly distracted in foreign language classes.

Since children with ASD find processing verbal information difficult, in the case of many instructions given in a foreign language by their teachers without sufficient visual support presented on the board, they may fall behind. They may not have heard and then cannot follow the given instructions. Consequently, if they are challenged to become organised quickly, they may anger the teacher by speaking back (Wire, 2005). Some researchers claim that children with ASD have some strengths in connection to learning a foreign language; they are visual learners with excellent visual long-term memory (Tissot & Evans, 2003), which can be very beneficial. However, Trembath et al. (2015) found no evidence of a prominent visual learning style in children with ASD.

Since their pace in doing tasks are generally slower than their typically developing peers, children with ASD may fall behind and become withdrawn from the language classes even if they are being prompted and motivated to continue with sufficient support from their teachers. In addition, they have significant difficulty understanding that words and phrases may have more than one meaning. If all the above-mentioned autistic characteristics are not tackled well, they may result in stress and difficulties accessing the curriculum (Wire, 2005). Consequently, much stress builds up for both the children with ASD and their teachers, and the desired goals of the learning process cannot be achieved.

Challenges

As well as emotion-related challenges, other factors or features may affect the academic performance of children with ASD. For instance, impaired gross

motor skills mainly affect their competence in physical education; moreover, poor fine motor skills may lead to laboured and slow writing, a slow working performance compared to the rest of the class, or even being reluctant to do any writing at all. Some children with ASD may also have a diagnosis of dyspraxia. For them, assistive technology devices such as a notebook may be useful in lessons. Some children with ASD may have also been diagnosed with attention deficit hyperactivity disorder; therefore, they may have poor concentration and present quite disruptive behaviours. Moreover, some also have a specific dyslexic learning difficulty; therefore, it is much harder for them to read in a foreign language and learn vocabulary. This can quickly cause frustration in foreign language learning and resistance to the foreign language. Crombie and McColl (2001) proposed a multi-sensory approach to children with dyslexia, including those with ASD.

Educational scholars have stated that emotions have a key role in motivating to learn (Bown & White, 2010; Garret & Young, 2009; Imai, 2010), because emotional experiences influence students' motivation significantly. Since emotions impact the motivation of foreign language learners by activating or deactivating motivational behaviour (Pekrun et al., 2000), Méndez López (2011) conducted research in Mexico to show the effects of the role of emotional experiences on the motivational behaviour of students and reported that in this regard emotional experiences have a considerable role during classroom instruction. It was proved that motivation is dynamic and evolving, and students can turn negative situations they experience into positive outcomes, because negative activating emotions affect motivation maintenance by triggering the motivational behaviour of students to deal with negative emotions in future academic tasks (Méndez López, 2011; Ryan & Deci, 2000). Negative emotions allow students to re-evaluate the events and accordingly adjust their motivation. Such a reflection process includes an attribution stage, in which learners explain to themselves why the event led to the emotion they experienced (Weiner, 1992). While negative emotions have an immediate negative effect on the motivational energy of students and result in task avoidance and even withdrawal from class activities, subsequent reflection allows the students to deal with that negative impact successfully and to re-energise themselves in order to resume their learning processes (Méndez López, 2011).

Many foreign language teachers have students struggling with learning in their classrooms. Foreign language teaching issues can contribute to teachers' anxiety about whether to launch a referral process for special education and how to implement and manage intervention programming (Dunn & Ernst-Slavit, 2018). In this regard, considering the important role of teacher beliefs in language teaching (Kubanyiova & Feryok, 2015), Barcelos and Aragão (2018)

discussed the findings of studies on teacher emotions carried out with both pre-service and in-service teachers of English in Brazil. Their study focused on the kinds of emotions of both pre-service and in-service teachers of English and on the relationship between emotions and beliefs in foreign language teaching. The results showed the diversity of emotions the teachers experienced during their teacher education and how those emotions interact in complex and dynamic ways with their beliefs about teaching English as a foreign language.

Opportunities

Humanoid robots are service robots shaped like human beings and designed to mimic human motion and interaction; therefore, they can interact with humans and their environments better. Although humanoid robots and social robots are sometimes used interchangeably, social robots are able to interact with humans and each other in a socially acceptable fashion and convey intention in a human-perceptible way (Breazeal, 2003). It has been shown that the coexistence of humanoid/social robots and humans may be beneficial, and several benefits can be achieved. For instance, humanoid/social robots can be used to support teachers and students by providing advice on routine, common questions and problems and offering assistance on issues that cannot be handled with simple Frequently Asked Questions (FAQ) systems. In this manner, the robots can promote teaching and learning processes. Humanoid/social robots can also be used to provide information services for users of facilities and offer advertisement services. The assumption is that, unlike basic FAQ systems, humanoid robots productively and effectively interact with humans with three special strengths (SoftBank Robotics & ERM, 2021). First, humanoid robots can have embodied multi-modal dialogues with humans in their familiar environment by combining posture, movement, language, facial expressions, eye contact, and gestures. Second, humanoid robots can cope with human emotions intelligently. Third, humanoid robots are able to build relationships with humans thanks to their special strengths. For instance, humanoid robots do not become angry or bored while carrying out some tasks repetitively.

If they can be easily deployed, used, and customised based on the special needs of each student and teaching activities, humanoid robots may not only challenge the students and promote positive behaviour but also follow and monitor their progress (SoftBank Robotics & ERM, 2021). Humanoid robots are suitable for both one-to-one and group work of students and are an attractive and engaging channel for entertaining and educational communication towards students. Furthermore, they can inspire and accompany children for

both physical and intellectual exercises and support the development of their social and emotional skills (SoftBank Robotics & ERM, 2021).

Nowadays, the use of emerging technologies in ASD treatment is focused on developing social and interactional skills, cognitive and emotional skills, expressive and communicational skills, and acquisition of knowledge. With their increasing sophistication, humanoid robots have enormous potential as a novel therapeutic means for various cognitive disorders. They are specifically designed and developed to reproduce human features, behaviours, and emotions but simplify their informational complexity (SoftBank Robotics & ERM, 2021). Therefore, they reduce the cognitive and emotional burden and decrease the possible stress for the person with whom it is interacting. For example, it has been shown that humanoid/social robots with multilingual interaction abilities can be employed in different roles in foreign language teaching (Tuna & Tuna, 2019), as listed in Table 1. Therefore, in addition to computers, smartphones and tablets, interventions based on humanoid robots are offered extensively for children with ASD. Unlike human-assisted intervention and child toys, humanoid/social robots can repeat their tasks endlessly without boredom and eliminate the concerns related to therapy intensification. However, humanoid/social robots are expensive, depending on the features they have. Moreover, they may replace human assistants as they can carry out routine tasks.

Table 1

Modes that humanoid/social robots can be used for foreign language teaching

Mode	Functions
Reading	The robot leads students to repeat aloud vocabulary and sentences, thus helping them improve their speaking skills. In addition, it can take the roles of different characters and do male/female voice transitions in this mode.
Storytelling	The robot plays stories and creates some sound effects to foster student engagement. It can also perform some comic actions for further student engagement.
Question-and-answer	The robot helps students use the foreign language properly to communicate and comment.
Action-command	The robot asks students to perform some selected tasks. In this mode, the students may ask the robot to do the same so that the robot obeys the instructions given by the students.
Cheerleader	The robot helps the teacher lead certain games, either single-player or group games. In some competitive games, it can take the role of a coach or a fair judge.

Note. Adapted from Chang et al., 2010.

It has been shown that children with ASD prefer interactive robots to static toys. Humanoid robots are anthropomorphic machines that offer predictable, identical, and consistent movements and a synthetic voice with limited intonation and no expression of personality (SoftBank Robotics & ERM, 2021). In addition, thanks to their software components, they can simulate basic social and affective abilities. Humanoid robots can attract children's attention, draw their curiosity and stimulate their interests. The characteristics of humanoid robots generally lead to better sensory receptivity and a decrease in anxiety in children with ASD. Humanoid robots are genuine therapeutic mediation tools for children with ASD; therefore, they are being used to support ASD interventions in different centres worldwide.

Learning means taking the risk of making a mistake. It also involves the worry of not being able to overcome or move past the mistake. After making a mistake, many children with ASD may think that they will never be able to perform the task effectively and that there is no point in trying it again. They will possibly have low or no self-esteem and feel useless. Their feeling is aggravated by growing anxiety and by the presence of someone else. Nevertheless, language learning is a process full of with both positive and negative emotions. Because of internal and external factors, foreign language learners experience different emotions and feelings during the learning process. Therefore, it is necessary to pay attention to emotions and feelings that originate during the language-learning process (Méndez López & Peña Aguilar, 2013). When teachers fail to appreciate the importance of the emotions of their students, they neglect a key factor in the learning process (Immordino-Yang & Damasio, 2007). Therefore, language teachers should manage their students' emotions appropriately so that their students are enabled to make their emotions work for them and not against them (Méndez López, 2011). Such a positive and motivating learning environment can be created by establishing strong teacher-student relationships and promoting group cohesion. However, to realise this, language teachers must show a strong interest in the learning processes of their students and must inspire trust and confidence in the students (Méndez López, 2011). By developing strategies to make the existing learning environment a positive, supportive, and motivating one, language teachers can help students feel confident and willing to participate in learning activities (Méndez López & Peña Aguilar, 2013). However, establishing positive and respectful relationships is not easy.

It has been shown that some tools are useful in overcoming emotion-related difficulties. For instance, emotion cards, cards with pictures of faces, either cartoon or real, can be used to teach children with ASD basic emotions. In addition, thanks to the advancements in technology, animations can be used

to teach emotions to children with ASD aged from two to eight years. Another useful approach could be using social stories (Gray, 1994) to explain social situations. For example, a social story in the form of illustrations or comic-strip conversations could be designed to incorporate feelings into the lessons.

Karimi and Chalak (2017) analysed the effects of applying visual prompts and input enhancement on improving the level of flexibility among English as foreign language learners with ASD in Iran. They recruited thirty participants, aged between 10 and 14, and divided them into three groups: a control group, an input enhancement group, and a visual prompts group. The control group received neither input enhancement nor visual prompts. The input enhancement group was provided with enhanced input by bolding target vocabularies. Finally, the visual prompts group was provided with target vocabulary through a set of visual prompts, including drawing illustrations and pictures. The results obtained after the treatment showed that using visual prompts increases the flexibility needed to acquire target words. It has been shown that visual support tools are considered an evidence-based approach (Steinbrenner, 2020).

Children with ASD often speak too quickly, garbling what they are saying, and typically their volume is too loud or soft. Nevertheless, even those with little speech might have a good comprehension of the foreign language and might be able to respond by nodding, by actions in role-play, by drawing, and even by using a handheld translator (Wire, 2005). In addition, a video camera or a voice recording device, even a computer, can allow playback, which illustrates a voice that is not appropriate in speed or volume for children with ASD. If the children are reluctant to be recorded, it is better to record something else by making the recording an integral part of the lessons (Wire, 2005).

Zheng et al. (2014) analysed the effectiveness of autonomous robot-mediated imitation learning for children with ASD using a system that offers autonomous, adaptive, and dynamic interaction with real-time feedback and performance evaluation for learning imitation skills. The results of their study showed that, compared to a human therapist, the robotic system engaged the children with ASD more and produced higher performance.

In childhood, the development of social competence is closely associated with emotion recognition skills, and the lack of emotion recognition skills is a typical sign of ASD. Costa et al. (2017) designed an intervention protocol in which a social robot similar to the one shown in Figure 1 is used to improve emotional ability in children with ASD. The training programme covering emotional concepts and social situations explained emotions in simple terms and using examples; the difficulty was increased progressively throughout the sessions. In addition, the sessions were built around games that fit the developmental

levels and ages of children to make the learning playful and pleasant. With a similar aim, Lecciso et al. (2021) compared the effectiveness of robot-based intervention and hybrid computer-based training with a standardised video of a peer for the development of facial emotion recognition and expression skills in children with ASD. They expected that the emotion recognition and expression skills of the children would improve via the imitation process, because Bruner (1974) stated that imitation is a critical process to learning social skills. At the end of their study, Lecciso et al. (2021) showed that robot-based intervention and hybrid computer-based training with a standardised video of a peer have almost the same success in fostering facial recognition and expression of some basic emotions in children with ASD.

A humanoid/social robot can perform many functions when working with a child. It can attract and stimulate the child's interest more than other children and foster proactive participation because the child recognises it as a playmate to interact with due to its more predictable interaction pattern. As well as a playmate, a humanoid/social robot can act as a treatment mediation under the control of a therapist. During the treatment sessions, it can automatically and continuously collect data for analysis. A humanoid robot is also useful as a learning support tool in areas such as imitation, which can cause-and-effect communication and social learning. The literature shows that when working with children with ASD, humanoid/social robots provide benefits at a behavioural level. Interacting with a robot reduces repetitive and stereotyped behaviours of children with ASD and improves their communication and language development. Importantly, children with ASD have many social behaviours towards robots, with characteristics quite resembling those that typically developing children have towards humans.

Table 2 lists the effects of humanoid robot-delivered therapy on children with ASD. The results are based on the following. First, the IQ levels of the participants were assessed using the Wechsler Nonverbal Scale of Ability (Wechsler & Naglieri, 2006). Next, the emotional abilities of the participants were measured using the parent-report measures, including the Emotion Regulation Checklist (Shields & Cicchetti, 1997), the Emotion Regulation Rating Scale (Gross & John, 2003), the Self-Control Rating Scale (Kendall & Wilcox, 1979), and the Alexithymia Questionnaire for Children (Bagby et al., 1994), as well as through a direct measure of children's use of emotion regulation strategies using the Reactive and Regulation Situation Tasks. Following that, the mental health of the participants was measured through the parent-report measures, including the Children Behaviour Checklist (Achenbach & Rescorla, 2001), the Strengths and Difficulties Questionnaire (Goodman, 1997), and SRS-2.

Figure 1

Humanoid Robot – NAO (Courtesy of SoftBank Robotics)

Table 2

The effects of humanoid robot-delivered therapy on children with ASD

Effects on	Results	Limitations/Drawbacks
Emotional Abilities	Higher emotional ability appropriateness	No significant changes in the parent-reported measures except for a little improvement in emotion control ability
Mental Health	Significantly fewer internalising problems such as depression and anxiety	Not a major difference in externalising problems such as impulsivity
ASD-Related Symptomatology	Significantly reduced ASD-related symptomatology in all scales, better social communication and less social interaction problems	None

Note. Adapted from Costa et al., 2019.

Some robots, particularly humanoid/social ones, can be programmed to teach a foreign language and have the features and abilities to do it successfully (Meghdari et al., 2013). In addition to playing games with students and engaging them in conversation, such robots can respond to the students' commands in the foreign language (Toh et al., 2016). Considering that the human teacher has the overall control of the conversation in student-teacher interaction, and the student responds with the help of a robot, the student can be the initiator of actions and have a better and more balanced dialogue (Newton & Newton, 2019). It is known that some students suffer from anxiety and embarrassment, which makes the development of proficiency in speaking a foreign language quite challenging (Newton & Newton, 2019; Newton, 2014). In contrast, compared to

anxiously interacting with another student or a human teacher, speaking with a robot can be less emotive for those students and leads to more positive attitudes to learning and better conversational proficiency as well as less anxiety (Alemi et al., 2014; Chen & Chang, 2008). As a humanoid/social robot can be programmed to be minimally expressive and interact indirectly, it can be used by children with ASD as a learning companion. By adjusting the robot's behaviour slowly to increase the robot's expression and interaction progressively, the oversensitivity of such children to human interaction may be gradually reduced. In this manner, these children become accustomed to human-like behaviours and develop socially (Esteban et al., 2017; Robins et al., 2009). This approach is useful if direct human interaction could present problems and if teachers feel it threatens their dignity or authority (Mubin et al., 2013). Another way of using a humanoid/social robot in the classroom is the 'learning by teaching' approach, in which the robot takes the role of the student, and the student takes the role of the teacher. Tanaka and Matsuzoe (2012) tested this approach with young children learning English and found that it had some potential. This approach can be engaging due to the novelty of learning with something new, but it may be short-term if what is learned is, in itself, not engaging (Hung et al., 2012; Newton & Newton, 2019).

NAO, shown in Figure 1, is one of the humanoid/social robots available on the market. It is fully programmable with a sophisticated Software Development Kit (SDK). It allows integration and implementation of cloud services and Application Programming Interfaces (APIs). By default, NAO supports two languages, but it can speak up to 21 languages and provide translation via cloud services. NAO can customise interactions via its sensors; therefore, it can identify the individual it is interacting with and then, based on this profile, it can adapt its behaviour appropriately (SoftBank Robotics & ERM, 2021). Furthermore, it can connect to the internet and communicate on-the-fly, searching the latest teaching materials and improving its behaviour to fit the target audience and local conditions. NAO and similar robots have an important role in language learning because it has been demonstrated that they can be used to support language development, promote writing skills, teach sign language, enhance reasoning, promote problem-solving skills, and foster self-regulated learning skills by using prompts (Newton & Newton, 2019). In addition, they can answer questions in small group work activities, allowing the teacher to allocate more time to other individuals or groups (Pandey & Gelin, 2017). However, some of the learning effects, as well as motivational effects provided by a robot, may be because of the novelty of using it in the classroom. With familiarity, such learning and motivational effects may decline (Baxter et al., 2015). In

addition, comparable learning effects could be achieved in vocabulary development by using tablets and computers (Vogt et al., 2019). Furthermore, as Van den Berghe et al. (2019) stated, the social behaviour of some humanoid/social robots may lead to a distraction, which results in significantly reduced learning. Nonetheless, it has been shown that teachers have some potential to teach successfully using them.

As mentioned above, there are different behavioural and psychodynamic intervention approaches for children with ASD. However, there is no universal model because the population of children with ASD is very heterogeneous. Although there are many challenges in teaching children with ASD, there are opportunities in this regard. For instance, the lack of flexibility, a distinct characteristic of children with ASD, is one such opportunity. It is typically complemented by a liking for routine, rote learning, and high levels of repetition. Children with ASD possibly put forth their very best effort in order to be successful in learning numbers, vocabulary, set phrases and grammar. By doing so, they acquire a solid grounding that aids them in dealing with the more challenging and demanding social interaction side of learning a foreign language (Wire, 2005).

Future Research Directions

Emotions lie at the centre of language learning and teaching, but they have mostly been omitted in applied linguistic research (Dewaele et al., 2019). However, in recent years, positive psychology interventions have been conducted in universities and schools to enhance learners' linguistic progress. Méndez López and Peña Aguilar (2013) reported that teachers have a considerable impact on the motivation of students and the learning environment and concluded that foreign language teachers should revise their teaching practices to handle the emotional experiences of their students in classroom settings. Emotions strongly impact the motivation of foreign language learners, not merely in classroom instruction (Garret & Young, 2009) but also in various individualised settings (Bown & White, 2010). Reflection on former teaching experiences has been shown to be quite useful in deciding areas that language teachers should consider (Méndez López & Peña Aguilar, 2013). As well as these, foreign language teachers should know the features of ASD.

Lecciso et al. (2021) proved the effectiveness of training using a technological device as a mediator of emotion recognition and expression. The results obtained in their study confirmed the benefit of the technological devices and showed that the use of a humanoid robot and a hybrid device performed almost

the same. Therefore, developing a research plan based on a repeated measures design that involves three phases and then implementing it could be a possible future work of this study. The first phase of that work is an intensive robot-based training. The second is the first generalisation with hybrid computer-based training, and the last is the full generalisation of gained skills in naturalistic settings towards peers and adults (Lecciso et al., 2021).

In addition to motivating students for both physical and mental fitness activities, by using their entertaining interactions. humanoid robots can efficiently present educational information and provide guidelines. Robots designed for children are perceived as friendly; therefore, they are easily accepted by students and students feel themselves more confident and relaxed to answer openly to questions. Thanks to the advantage of embedded computing services and cloud-based ones in real time analysis, with their continuously evolving behaviours, state-of-the-art humanoid robots can interact with students effectively. They can generate insights by collecting data from the sensors and allow their users to carry out survey research to understand the students' behaviours and this way provide regular and detailed feedback to the teachers on the advancement of the students.

Although humanoid robots offer some benefits, teachers need training for core features of ASD and working with the robots and comprehending how artificial intelligence/human interface can be achieved in the classroom. In this training, teachers should be informed of the positive and negative aspects of this approach. In addition, teachers should be informed of how children's relationships with humanoid robots change gradually and with use if robots act as in some specific roles such as teachers (Newton & Newton, 2019; Spirina et al., 2015). If humanoid robots are used in classroom settings for a long time, teachers will possibly obtain clues on evolving humanoid robot-student relationships and the development of students' personal identities (Newton & Newton, 2019).

The advances in artificial intelligence and developments in robotic technologies are quite encouraging for stimulating interactions with children with ASD and making more reliable assessments. Nevertheless, robotic technologies still have various limitations. Most pre-programmed robots have fixed behaviours and cannot be tailored to the individual needs of each child (SoftBank Robotics & ERM, 2021). Therefore, they are not able to autonomously carry out adaptable closed-loop interactions and cannot continuously monitor the children's progress. Consequently, it is necessary to have adaptive, semi-autonomous robots to recognise the children's behavioural cues and then respond accordingly. However, such systems, especially complex ones, need high-performance hardware to process real-time data and update interactions (SoftBank

Robotics & ERM, 2021). Therefore, low-cost and reliable fully autonomous and complex robots designed for intervention protocols are highly needed.

While new technologies are important to support learners' engagement and assist students' research on identifying when not to use a specific technology is required. In addition, there is a need to teach both children and their families (and even their teachers) to use such technologies with discretion and discernment (Newton & Newton, 2019). Moreover, the increasing capabilities of artificial intelligence has led to questions about different matters of ethics that cannot be overlooked. Therefore, they must be carefully handled, properly addressed, and continuously monitored. While some technological limitations or constraints in the ability of artificial intelligence to recognise speech and reply to arising questions remain, these limitations will possibly considerably lessen in the near future (Crompton et al., 2018; Newton & Newton, 2019). However, artificial intelligence is quite different from human intelligence in many aspects, and even sophisticated humanoid robots do not think like people. In this regard, there is a need for extensive collaboration between robot manufacturers, sociologists, ethicists, teachers, and programmers to ensure that rights are observed sufficiently, and ideological and cultural matters are taken into consideration effectively (Newton & Newton, 2019).

Conclusion

Researchers have identified the role and effects of emotional experiences in foreign language learning and have proved that such experiences can impact students' motivation and cause different reactions for each student. Like typically developing children, children with ASD experience emotions and want to communicate them to those around them. Nevertheless, they have impairments in social cognition and often encounter difficulties in expressing themselves, including unusual social communication, impairment in social interaction skills, and lack of flexibility. In addition, they have difficulty in communicating by imitating the emotional expressions of others. Normally, if students perceive that a given task is challenging but feel relief, pride or joy while doing it, they attempt to adjust their perceptions and also become willing to engage in future activities. However, the emotional codes of individuals with ASD are quite different from others.

The literature shows that emotions contribute to enhancing and diminishing motivation for both children with ASD and typically developing children. Although the emotional codes of children with ASD are different, humanoid robots can help children with ASD to improve their skills in recognising other

people's emotions and responding to them. Most sophisticated humanoid robots have multilingual interaction skills, and they can guide foreign language learners by using both their native language and foreign language. This could help to eliminate emotion-related challenges that children with ASD encounter in foreign language learning.

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