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Development of the Rob'Tales Methodology to Teach Emotional and Social Skills to Autistic Adolescents

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ABSTRACT

Background: Autistic adolescents frequently experience difficulties with emotional and social skills. Robots are promising tools to promote the development of those abilities. This study aimed to develop a robot-assisted therapy named Rob'Tales, targeting social and emotional skills in autistic adolescents.
Methods: Intervention development was based on three complementary sources of information: (1) a scoping review to identify didactic techniques used in evidence-based practices and potential intervention targets, (2) a feasibility study to refine the intervention structure, (3) autistic individuals opinions to define the curriculum.
Results: Two interventions considered as EBP were identified: Social Skills Training and Cognitive Behaviroral/Instructational Strategies. Common modules taught in SST were listed. These results were used to create a first version of Rob'Tales, implemented in a feasibility study whose results inform about the strengths and shortcomings of this first version. Preference ratings showed that modules related to psychoeducation, emotion, and interpersonal problem solving should be prioritized.
Conclusion: This paper presents the construction of Rob'Tales, built from three different sources of information. Its efficiency promoting emotional and social well-being of autistic adolescents should be tested.

Keywords: Adolescence, Autism, Robot-assisted therapy, Social skills, Emotional skills, Conception

INTRODUCTION

Adolescence represents a critical developmental period during which individuals experience substantial social, emotional, and cognitive changes. They can encounter difficulties in emotional regulation, and are hypersensitive to emotional stimuli, to their peers influence, and to peer rejections (Andrews, Ahmed Blakemore, 2021). This is especially true for autistic adolescents. On average, autistic adolescents experience alexithymia more frequently (Milosavljevic *et al.*, 2016), have a lower emotional self-awareness (Huggins *et al.*, 2020), experience more difficulties in emotion regulation (Restoy *et al.*, 2024), and suffer more often from loneliness (Kiliç Tülü, Özbek Girli, 2026). This can have an impact on their well-being. During adolescence, brain maturation processes are observed in regions involved in emotion processing

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and social skills (Andrews, Ahmed Blakemore, 2021). Hence, adolescence is considered as a sensitive period to promote their development.

Robots are promising tools to train emotional and social skills of autistic people (Zhong *et al.*, 2025). They are predictable, non-judgmental, simplified interactive agents, and entertaining (Cabibihan *et al.*, 2013; Dubois-Sage *et al.*, 2024), which allow participants to work on social and emotional skills in a reassuring and non-overwhelming setting. Studies on Robotic-Assisted Therapies (RATs) focus mainly on children and not on adolescents (Santos *et al.*, 2025). In addition, most of them propose short interventions with less than 5 sessions, and of less than 15 minutes duration (Santos *et al.*, 2025). These limitations highlight the need to develop novel reproducible RATs.

The opinions of autistic people should be taken into account in the development of new interventions. Programs such as Social Skills Training (SST) are criticized because they may encourage the development of masking behaviors (i.e hiding of autistic traits to look neurotypical) (Graf-Kurtulus Gelo, 2025), that is associated with poor mental health (Hull *et al.,* 2021). In addition, they may not always meet autistic individuals' needs (Hull *et al.,* 2025).

This study aimed to present the development process of a new RAT, Rob'Tales, targeting the social and emotional skills of autistic adolescents. This methodology was designed based on a scoping review of evidence-based practices (EBP), findings from a feasibility study (Dumas *et al.,* in press) and preferences expressed by autistic individuals regarding intervention content.

MATERIAL AND METHODS

Study Design

The present study aimed to develop a RAT targeting social and emotional skills in autistic adolescents. The intervention was developed based on 3 sources of evidence: (1) a scoping review conducted to identify interventions considered as EBP (2) a feasibility study to adjust the intervention structure, and (3) autistic individuals opinions to choose the intervention curriculum. Findings from all stages were synthesized to create the Rob'Tales methodology. This study was approved by an institutional research ethics committee.

Stage 1: Search for Evidence Based Practices

Steinbrenner *et al.* (2020) produced a report identifying 28 practices considered as EBP. To create the main structure of the program, we decided to focus on EBPs identified in this report as effective in improving social skills, mental health, and communication in adolescents aged 12 to 16 years.

To identify the module taught in current programs targeting social and emotional skills, we conducted a scoping review on the EBSCOhost database, by using the search terms TI ("autism" OR "ASD" OR "Asperger" OR "autistic") AND TI ("social skills training" OR "social skills intervention" OR "social skill development" OR "social communication intervention"), and by looking at programs included in systematic reviews found in the process. We decided to focus more specifically on the curriculum of programs considered as SST, as it is one of the most common intervention proposed to autistic adolescents (Lord *et al.*, 2018). Module were selected if they were

present in at least 5 SST programs. Then, they were merged into broader categories based on their common features.

Stage 2: Feasibility Assessment

The first version of Rob'Tales was implemented in a feasibility study involving four autistic adolescents, enrolled in a medical educational setting. The goal of this stage was to identify the strengths and shortcomings of this intervention, and especially of its structure. A detailed description of this first version of Rob'Tales, and of the feasibility study results has been reported in (Dumas *et al.*, in press). A list of strengths and shortcomings regarding the program structure was created, and adaptations were proposed.

Stage 3: Assessment of Content Preferences

We designed a survey on LimeSurvey (Version 6.15.20+251021) to ask autistic people about their opinion and expectations on SST. This survey was only available in French. We shared it on social media (e.g. forums, Discord groups, Facebook group, and Reddit groups related to autism), and through emails to autism societies. The diffusion took place between April 2025 and June 2025. The inclusion criteria were that the participant should be diagnosed autistic, undergoing a diagnosis process, or self-diagnosed. Participants gave informed consent at the beginning of the survey. Table 1 presents the main characteristic of the participants included in this survey.

Table 1: Main characteristics of participants included in stage 3.

n	**32**
Gender	Woman: ≃59% ; Man: ≃31% ; Non-binary: ≃9%
Age	≃34 years old (± 12 years)
Diagnosis status	Diagnosed: ≃69% ; Undergoing: ≃22% ; Self-Diagnosed: ≃9%

The survey was composed of three parts, asking questions about (1) participants identity (2) their expectations of SST, and (3) their opinions on current SST content. The third part was used to conceive Rob'Tales. Participants had to rate SST items, coming from the Stage 1 review, on a seven point Likert Scale (–3 = "very harmful", –2 = "harmful", –1 = "rather harmful", 0 = "neither harmful nor beneficial", 1 = "rather beneficial", 2 = "beneficial" or 3 = "very beneficial").

To analyze autistic people ratings of items depending on their categories, we conducted a one-factor repeated measured ANOVA, with a Greenhouse-Geisser correction to correct for sphericity violation, on Jamovi (version 2.6.26). The five preferred items, that is those rated the highest on average, were also reported.

Stage 4: Development of the Final Intervention

The final intervention was developed through the integration of findings from all three stages. Stage (1) informed the general structure and content of the intervention, Stage (2) informed decisions regarding the intervention structure, and Stage (3) informed the selection of intervention content.

RESULTS

Stage 1: Search for Evidence Based Practices

Two interventions were identified as effective to improve social skills, communication and mental health of autistic adolescents aged between 12 and 16 years old: Social Skills Training (SST) and Cognitive Behavioural/ Instructional, Strategies (CBIS) (Steinbrenner *et al.,* 2020). They often use a lesson time, where a skill is taught thanks to explicit learning and direct strategies, and a practical time where the new skill is trained thanks to role-play, modelling, and feedback.

Regarding the intervention content 39 programs categorized as SST were found, and 57 items were identified. They could be categorized in the following categories: conversation (n = 14), interpersonal problem solving (n = 10), emotions (n = 8), using nonverbal communication (n = 7), collaboration (n = 6), understanding others (n = 5), relationships (5 items), and psychoeducation (n = 2).

Stage 2: Feasibility Assessment

A first version of Rob'Tales was created from stage 1. It was composed of 11 weekly sessions of 1h15 each. Each session was divided in 5 different parts lasting 15 minutes each: (1) a review part, (2) a theory part where a lesson was taught (3) a break time, (4) a practical part where the NAO robot told stories to the participants who had to make choices and answer questions related to the trained skill; a tablet was used to share information and to collect participants' answers, (5) a free time part. A description of the first version of Rob'Tales and the main findings of the feasibility study are described in (Dumas *et al.,* in press). Table 2 presents the modifications applied to build the new version of Rob'Tales. Besides these modifications, a new time was added to the session: a play time with NAO. This time aimed to propose a space where they can play with NAO, to maintain their interest for the robot and their engagement in the program.

Table 2: List of modifications that should be made to Rob'Tales according to stage 2.

Rob'Tales 1	Modifications
Review Part	Suppression of homework Transformed in reminders of the previous sessions
Theory Part	Simplification of the lessons vocabulary Systematic addition of illustrations or mimes
Break Time	No modification
Practice Part	Lessening of the number of content presented on the tablet Shortening of the time were NAO spoke without interruptions Using only simple stories with minimal to no plot Lessening of the number of written information Simplification of the vocabulary
Free time part	Suppression of the free time part
Material	No modification
Setting	No modification: same number of referees, same room configuration
Number of session	Increase in the number of sessions

Stage 3: Assessment of Content Preferences

A one-factor repeated measures ANOVA with a Greenhouse-Geisser correction was conducted to examine the effect of item category on participants' rating. There was a significant difference in rating of at least 2 categories ($F(3.99, 31) = [43.9]$, $p < 0.001$, $n^2p = 0{,}428$). Post hoc Turkey-adjusted tests showed that *psychoeducation* was rated significantly higher than *conversation* ($t(31) = 6.388$, p-Turkey < 0.001, Cohen's $d = 1.13$), *use of non-verbal communication* ($t(31) = 7.022$, p-Turkey < 0.001, Cohen's $d = 1.24$), *relationships* ($t(31) = 4.162$, p-Turkey = 0.005, Cohen's $d = 0.736$), *collaboration* ($t(31) = 5.696$, p-Turkey < 0.001, Cohen's $d = 1.01$) and *understanding others* ($t(31) = 5.064$, p-Turkey < 0.001, Cohen's $d = 0.895$). Ratings for to the category *emotions* are significantly greater than those of *use of non-verbal communication* ($t(31) = 6.788$, p-Turkey < 0.001, Cohen's $d = 1.2$), *conversation* ($t(31) = 5.479$, p-Turkey < 0.001, Cohen's $d = 0.969$), *collaboration* ($t(31) = 4.211$, p-Turkey = 0.004, Cohen's $d = 0.744$), and *understanding others* ($t(31) = 3.492$, p-Turkey = 0.028, Cohen's $d = 0.617$). *Interpersonal problem solving* ratings are significantly greater than those for *use of non-verbal communication* ($t(31) = 6.446$, p-Turkey < 0.001, Cohen's $d = 1.14$), *conversation* ($t(31) = 6.336$, p-Turkey < 0.001, Cohen's $d = 1.12$), *collaboration* ($t(31) = 4.493$, p-Turkey = 0.002, Cohen's $d = 0.794$) and *understanding others* ($t(31) = 3.360$, p-Turkey = 0.038, Cohen's $d = 0.594$) ratings. *Use of non-verbal communication* ratings are significantly lower than all others categories ratings except *collaboration* (conversation: $t(31) = -3.532$, p-Turkey = 0.025, Cohen's $d = -0.624$; relationships: $t(31) = -5.554$, Cohen's $d = -0.982$, p-Turkey < 0.001; understanding others: $t(31) = -6.193$, p-Turkey < 0.001, Cohen's $d = -1.09$). Finally, the *conversation* category was rated lower than the *relationships* category ($t(31) = -3.446$, p-Turkey = 0.031, Cohen's $d = -0.609$). Figure 1 shows these results, and Table 3 presents the five best-rated modules.

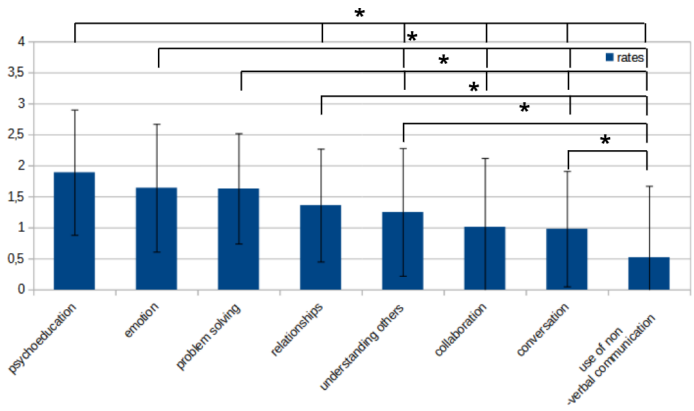

Figure 1: Mean module ratings by category among autistic individuals. * = p-Turkey < 0.05.

Table 3: List of the five best rated modules.

Module	Mean Rates (SD)
Saying no, refusing, setting boundaries	2.28 (± 0.95)
Learning about autism, knowing one's strengths, abilities, and difficulties	2.06 (± 1.16)
Handling teasing and bullying	1.96 (± 1.37)
Expressing one's need and wishes	1.93 (± 1.1)
Emotion regulation (anxiety, sadness, angriness, joy, envy)	1.83 (± 1.83)

Stage 4: Development of the Final Intervention

The results of stages (1), (2), and (3) were taken into account to design the new version of the Rob'Tales program. This program is composed of 14 sessions of 1h30 each. The new structure of this program is (1) Review part (15 minutes), (2) Play time with NAO (15 minutes), (3) Recreation (20 minutes), (4) Lesson, where a new skill was presented thanks to explicit learning strategies (15 minutes), (5) Exercises where the NAO robot tells short stories to the participant, and asks questions in relation to the skill trained during the lesson (25 minutes). Regarding the curriculum, the new Rob'Tales program focus on psychoeducation, emotion, and interpersonal problem solving. A description of each session structure and content is presented in Table 4.

DISCUSSION

This study aimed to develop Rob'Tales, a RAT targeting social and emotional skills in autistic adolescents By combining didactic techniques from EBP identified in the literature, results from a feasibility study, and preferences expressed by autistic individuals, the study aimed to develop a methodology based on pre-existing evidence, compatible with real-world constraints, and aligned with stakeholders' expectations.

Difficulties related to emotional and social skills have been associated with educational, social, and mental health outcomes (Durlak *et al.*, 2011; Žic Ralić, Bubalo Vrankić Pavon, 2025). Developing interventions targeting these skills may therefore contribute to supporting the mental health and well-being of autistic adolescents. The use of RAT may further support engagement. Previous studies have suggested that robots may facilitate participation and increase autistic people motivation (Dubois-Sage *et al.*, 2024).

Several limitations should nevertheless be acknowledged. First, the different stages of intervention development involved relatively small samples, which may limit the generalization of the findings. Second, the present study focused on intervention development rather than effectiveness. No conclusions can be drawn regarding the impact of the intervention on social-emotional outcomes. Thirdly, the results from the feasibility study rely on feedback from two members of the research team: those results are subjective, and could be biased. Finally, Rob'Tales was designed for adolescents, but mostly adults answered in the Stage 3 of the study. Adults' perspective is still an interesting

feedback, as they may have tested SST, and toffer retrospective insight into their experience. Future research should evaluate the effectiveness of the final intervention protocol using larger samples and psychological testing related to well-being and social-emotional skills. In addition, autistic people opinions were collected only on the third stage of the study: the final program should be presented to stakeholders, to assure that it actually fits their needs and expectations. Finally, although the intervention was developed specifically for autistic adolescents, difficulties regarding emotional awareness, emotion regulation, and more broadly social skills are not unique to autism. Future studies may therefore investigate whether Rob'Tales could be proposed to adolescents presenting social-emotional difficulties in general, with or without a diagnosis.

This study describes the development of a RAT targeting social-emotional skills in autistic adolescents through integrating techniques from EBP, findings from a feasibility study, and stakeholder perspectives. The resulting intervention, Rob'Tales, should be tested in educational and medical settings.

Table 4: Description of the new version of the Rob'Tales methodology.

	Reminders	Game With NAO	Theme of the Lesson	Exercise With NAO
1	Presentation of the program	Participants make NAO say something one at a time	Knowing one's strengths and difficulties	Participants have to guess what NAO likes, dislikes, finds easy, and find difficult within a restricted list of activities by asking yes-no questions.
2	Review of the previous week	One at a time, participant make NAO mime an sport movement from a list, others have to guess the sport.	Defining emotions and their goals	NAO tells the story of someone feeling different emotion. Participants have to guess the emotion, and determine if they find it pleasurable or not.
3	Review of the previous week	Participants make NAO say something one at a time, and demonstration of a danse on the robot.	Link between emotions and situations	Participants choose an emotion, and are asked to construct on object that can induce this emotion. They show their production to NAO which react by miming the expected emotion.
4	Review of the previous week	One at a time, participant make NAO mime an animal movement from a list, others have to guess the animal.	Link between body sensations and needs	NAO mimes some yoga posture, and participants should imitate it. Participants are encouraged to be mindful of their body sensations.

(Continued)

Table 4: Continued.

	Reminders	Game With NAO	Theme of the Lesson	Exercise With NAO
5	Review of the previous week	Exquisite corpse game: participant chose one at a time a word, and secretly program it on NAO. NAO say the final sentence.	Link between body sensations and emotions.	NAO describes some sensations, and participants should determine which emotion is the most likely associated with those sensations.
6	Review of the previous week	Rebus game: each participant secretly look at an image, and program NAO to say the word seen. We listen to the result: if they are correct, it forms a word.	Link between thoughts and emotions	Each participant draw an emotion, and a situation. Then they find a thought that would link them. NAO is programmed to say their sentences, and other participants are asked to guess the emotion.
7	Reminders the 6 first sessions	Participants have to complete 4 trials in which (1) NAO mime some emotions, (2) NAO describe some situations (3) NAO says a situations and a through (4) NAO describe some body sensation. For each trial, they have to guess which emotion is the most likely represented. After each trial, a part of a robot made out of paper is given to them, and they can build it.		
8	Review of the previous week	Follow up of the previous session	Introduction to emotion regulation concept	Exercise of the flower and the candle with NAO.
9	Review of the previous week	Participants make NAO say something one at a time	Adaptative and maladapta--tive emotion regulation strategies	NAO tell some stories about someone living some emotions, and using different emotional strategies to handle them. Participants have to identify which strategy is used, and if it is an adaptative strategy or not.
10	Review of the previous week	One at a time, participant make NAO mime an animal movement from a list, others have to guess the animal.	Use of emotional regulation strategies	NAO tells the story of someone living emotions, and the participant have to guide them step by step to regulate their emotions.
11	Review of the previous week	Rebus game	Expressing one's needs, wants, and feelings	NAO tells the story of someone having trouble expressing its wants, needs, and feelings. Participants have to identify how they could express it.

(Continued)

Table 4: Continued.

	Reminders	Game With NAO	Theme of the Lesson	Exercise With NAO
12	Review of the previous week	Participants control NAO one at a time to play a "Simon says" game with a set of pre-programmed movements options.	Saying no, refusing, setting boundaries	NAO tells the story of someone encountering situations of boundaries settings, and boundaries violation. Participants should identify those situations, and find ways to expression their boundaries.
	Review of the previous week	Participants make NAO say something one at a time	Handling disagreements, Mistakes, misunderstandings	NAO tells the story of people disagreeing, making mistakes, and misunderstanding each other. Participants should identify those situations.
14	Review of the previous week	Participants control NAO one at a time to play a "Simon says" game with a set of pre-programmed movements options.	Handling joking, teasing, bullying	NAO tells the story of someone encountering situations of friendly joking, teasing, and bullying. The goal is not to tell the participant how they should act in those situations, but how to handle it emotionally, and how to enforce their limits.
15	Review of what was seen since session 10		Final celebration : participants are awarded by a diploma.	

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