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Research Article

Acceptance of educational robotics: Evolution and validation of the unified theory of acceptance and use of technology via structural equation modeling

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ABSTRACT

Fully understanding factors that are related to teachers' behavioural intentions to use and acceptance of Educational Robotics (ER) in their classes, particularly among students with disabilities, is a big challenge. In particular, social psychology models may be used more consistently to inform scholars about the paths and the strength of interrelated factors influencing learning support teachers' acceptance of ER. In this study, the Almere model, an evolution and adaptation of the Unified Theory of Acceptance and Use of Technology (UTAUT) as used in Conti and colleagues was validated. The model is directed to measure acceptance of ER in a sample of 319 learning support teachers via structural equation modeling. Results showed a model explaining a good percentage of variance. In the learning support teachers' intentions to use ER with students with disabilities, positive and direct effects were exerted by teachers' positive attitudes toward robotics, and by their perception of the enjoyment and usefulness of robotics. Furthermore, results showed that perception of enjoyment in using ER was strongly and positively associated with perceived sociability and this, in turn, was positively associated with levels of trust. Finally, perceived sociability was positively associated with social presence perceptions.

Keywords: UTAUT; STEM; Almere model; educational robotics; acceptance; structural equation modeling

1. Introduction

Over the last few years, the interest in robotics and Educational Robotics (ER) has increased widely creating numerous opportunities for its implementation in schools to promote scholastic and academic achievement, support computational thinking, and offer new learning and socially inclusive opportunities for special education needs[1–10]. However, despite evidence of its efficacy, some hesitation still exists concerning the use of robots, especially in the fields of care and education[3,11,12]. A seminal theory and empirically credited model for the study of acceptance and use of technology is the Unified Theory of Acceptance and Use of Technology (UTAUT)[13]. It was developed as a model of general technology acceptance deriving and implementing eight existing models of technology acceptance and usage[12]. UTAUT was also adapted for exploring attitudes towards social robots by Heerink and colleagues[14,15], and

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by Conti and colleagues[16] in educational contexts.

This research focused on the predictions of Conti et al.[16] to validate a version of the UTAUT model-via structural equation modeling-directed to measure the acceptance of ER among learning support teachers. Heerink et al.[14]suggested that the perfect way to analyze the interrelations among the factors of UTAUT would indeed be to apply structural equation modeling. This is one of the few studies to apply structural equation modeling to establish paths and the strength of interrelations among factors in the UTAUT model for exploring learning support teachers' acceptance of ER.

Models on acceptance and use of technology

A recent systematic review exploring people's trust in, anxiety with, and acceptance of social robots[17] showed that people tend to have a positive acceptance of acceptance of social robots and are willing to interact with them. However, it has been argued that more research is needed to inspect all the factors influencing attitudes in human-robot interaction (HRI). It has also been argued that the social psychology models should be used more consistently in this field of research. One example of these models is UTAUT conceptualized by Venkatesh and colleagues in 2003[13].

This model was developed to predict the acceptance and use of technology and holds together the most important concepts derived from previous models, such as Theory of Reasoned Action[18], Technology Acceptance Model (TAM)[19], Motivational Model[20], Theory of Planned Behavior[21], Model of PC Utilization (MPCU)[22], Innovation Diffusion Theory[23], and Social Cognitive Theory[24] (see also Venkatesh et al.[13]for further details on the core constructs of these models). It was also related to the integrated model of technology acceptance known as TAM3[25] that explores the determinants of users' Information Technology System adoption and includes determinants such as the perceived usefulness of system, perceived ease of use and behavioral intentions[25].

The original UTAUT model theorized that four constructs predict users' acceptance and usage behaviours: performance expectancy, effort expectancy, facilitating conditions, and social influence. Performance expectancy describes the extent to which people believe that using the specific technology will help them to achieve useful results for job performance. Effort expectancy represents the degree of effort that people tend to associate with the use of technology. The facilitating conditions factor represents the extent to which people believe that organizational and technical infrastructures support the use of technology. Finally, social influence represents the extent to which people perceive that others believe it is relevant to use technology.

Since its establishment, UTAUT was used and adapted for the study of acceptance and usage of different types of technologies and robotics in various fields. Some authors have suggested that the model or parts of it can be adapted and re-validated for different systems, different typologies of technologies and robots, and in different contexts[14,26,27]. In 2012, Venkatesh et al.[13] extended UTAUT into UTAUT 2 incorporating three further constructs into the model: (1) hedonic motivation (i.e., the fun or pleasure in using a technology); (2) price value (i.e., the cost and price of technologies); and (3) habit (i.e., the habit in using technology and the related experience that leads people to perform behaviours with the technology automatically). The new UTAUT 2 produced a significant improvement in the variance explained from the model[28].

In 2009, Heerink et al.[14] measured acceptance of an assistive social robot for elderly care environments administering a survey to eldercare personnel and students. The UTAUT model was adapted focusing on 11 constructs that could be applicable to the specific user group of older adults interacting with social robots. Using controlled experiment and longitudinal data, Heerink and colleagues[15] validated an adaptation of the

UTAUT model (i.e., the Almere model, see also Felding et al.[29] for a review) to predict and explain acceptance of assistive social robots among older users. Furthermore, adapting this instrument and the prediction of Heerink et al.[14,15], Conti and colleagues[16] tested some of the predictions of the UTAUT model (in the UTAUT version proposed by Heerink et al.[14]) concerning the acceptance of robots in the field of ER among 25 experienced Italian practitioners (specialized in the treatment of intellectual disabilities), and 55 Italian university students. Conti and colleagues showed positive attitudes toward the use of a NAO Humanoid Robotic Platform. However, the authors did not perform validation analyses such as structural equation modeling.

2. The current study: Aims and hypotheses

Based on the identified variables of the UTAUT model presented in the Conti et al.[16] study, and the Almere model[14,15], a model was developed in which all relevant factors were incorporated. In the Conti and colleagues survey, 10 dimensions of the model were as follows[1]: (1) Anxiety (ANX) that describes an emotional feeling of apprehension in the use of a robot; (2) Attitude (ATT) that indicates a positive or negative evaluation about the use of a robot; (3) Intention To Use (ITU) that represents the factor measuring the intention to use a robot; (4) Perceived Adaptability (PAD) that describes the users' perceived ability of a robot to be adaptive to changing needs; (5) Perceived Enjoyment (PENJ) that describes the users' perception that using a robot is enjoyable in its own right, aside from any utilitarian consideration; (6) Perceived Sociability (PS) that measures the perceived ability of a robot to perform sociable behaviours; (7) Perceived Usefulness (PU) that captures the perception that a robot will increase the user's performance; (8) Social Influence (SI) comprising the perception that others believe it is relevant to use a robot; (9) Social Presence (SP) that describes the user's perception of sensing a social entity and really being present in the company of a social entity when thinking about a robot[30]; and finally, (10) Trust (TRST) that measures perception that a robot can perform with integrity and reliability.

The main aim of this study was to understand the intention to use ER by Italian learning support teachers. **Figure 1** represents the model showing the variables and their relationships. As can be seen from **Figure 1**, TRST, ANX, PAD, and SI are the exogenous latent variables, the other remaining variables (including PS, SP, PU, ATT, PENJ, and ITU) are the endogenous latent variables.

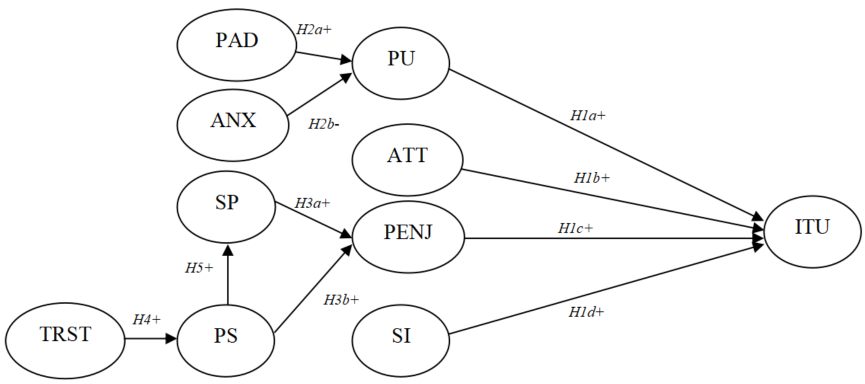

Figure 1. The conceptual model for the intention to use ER by learning support teachers.

The latent variables and manifest variables are shown in Appendix.

Based on the aforementioned studies[14–16], 5 main hypotheses were tested on the factors predicting the intention to use robotics. Specific to the first prediction and implementing the most important concepts derived from previous models, intention to use would be related with teachers' positive attitudes[14–18]. It would be also related to the degree to which people believe that using robotics would enhance their work activities[4,14,15,19] as well as the degree to which an individual feels it is important for others to use ER[14–16,18] (i.e., positive social influence) Furthermore, motivational factors such as feelings of joy and pleasure associated with the use of robots have been shown to play an important role in determining technology acceptance and use[31]:

H1: Intention to Use (ITU) robotics would be positively associated with (a) Perceived Usefulness (PU), (b) Attitude (ATT), (c) Perceived Enjoyment (PENJ), and (d) Social Influence (SI).

In addition, previous studies also showed that when people perceive ER to be suited to their changing needs, they also perceive it to be more useful[4,15]. Research evidence also showed that anxious reactions when using robotics are negatively related with the degree to which a person believes robotics is useful[16]:

H2: Perceived Usefulness (PU) concerning robotics would be positively associated with (a) Perceived Adaptability (PAD), and negatively associated with (b) Anxiety (ANX).

Furthermore, the perceived social presence, or the feeling of being there with a "real" person, was found to be related with perception of enjoyment[15]. Perceived sociability (i.e., the social abilities of a robot which enable it to function as an assistive device) was similarly found to be related with the Perceived Enjoyment in using robotics[15,16]:

H3: Perceived Enjoyment (PENJ) concerning robotics would be positively associated with (a) Social Presence (SP), and (b) Perceived Sociability (PS).

Finally, in line with Conti et al.[16], it was also predicted that social presence would be related with perceptions of sociability that, in turn, would be related with trust in robotics:

H4: Perceived Sociability (PS) of robotics would be positively associated with Trust (TRST).

H5: Social Presence (SP) of robotics would be positively associated with Perceived Sociability (PS).

3. Methods

3.1. Participants

Participants were 319 Italian teachers aged from 25 to 58 years (*M* = 37.16 years, *SD* = 7.88), attending a one-year post-degree specialization course for learning support teachers in 2020. Participants were 286 females (89.7%) and 26 males (8.2%). Seven participants were missing according to gender. Experienced educators introduced and explained the methodological principles of ER, the related theories, offered an introduction to programming, and simulated some activities of ER activities with school children using robots. The course content was relevant to training support teachers offering interdisciplinary training, and including workshops and internship. The participants gained experience with LEGO Mindstorms EV3, Bee/Blue-Bot, Ozobot, and Lego Wedo. Participants had to pass a final assessment.

The teachers received a link to the anonymous Web-based survey implemented by Google forms at the end of the course. The research was conducted in accordance with the Ethics Code of the Italian Psychology Association[32] (Associazione Italiana di Psicologia) and the WMA-Declaration of Helsinki[33].

3.2. Materials

The 31 items from UTAUT model[16] (permission to use the scale was requested; see **Table A1** in Appendix for a list of variables), also defined "Almere model" in the Heerink and colleagues[14,15] studies on social robots, were administered in Italian and adapted to this specific research context involving learning support teachers. As for the adaptation of the instrument, researchers added the following sentence to almost every item: "In my work/in my work context" (e.g., "I think a robot can be adaptive to what I need in my work") in order to make the scale appropriate to measure perceptions and attitudes concerning ER. However, when rephrasing the items, the original wording of the items was maintained as much as possible. The participants were asked to indicate their level of agreement with the statements on a 5-point Likert scale (from 1 = totally disagree; up to 5 = totally agree). Participants first read: "Take a few minutes and try to imagine using Educational Robotics in your work. What is your first impression?" They then rated the 31 items corresponding to the 10 factors incorporated in the model: (1) ANX: 4 items; $\alpha = 0.75$; (2) ATT: 3 items; $\alpha = 0.92$; (3) ITU: 3 items; $\alpha = 0.93$; (4) PAD: 3 items; $\alpha = 0.73$; (5) PENJ: 4 items; $\alpha = 0.82$; (6) PS: 3 item; $\alpha = 0.89$; (7) PU: 3 items; $\alpha = 93$; (8) SI: 2 items; $r = 0.74$, $p < 0.001$; (9) TRST: 2 items; $r = 0.69$, $p < 0.001$; (10) SP: 4 item; $\alpha = 0.85$. Three items were judged repetitive and/or not understandable to the specific research sample; these items were deleted following similar deletions in Han and Conti[12] (i.e., "I find the robot enjoyable"—PENJ; "I often think the robot is not a real person"—SP; "I feel the robot understands me"—PS).

3.3. Data analysis

Analyses were performed using M-PLUS[34] and Statistical Package for Social Sciences (SPSS) version 25.0. The items were preliminarily submitted to check the normal distribution by calculating mean, standard deviation, and indices of Skewness and Kurtosis; West et al.[35] recommend concern if skewness > |2| and kurtosis > |7|. Cronbach's alpha (α) was also inspected assuming that scores below 0.05, and superior to 0.09 are unacceptable and excellent reliability indicators, respectively. Cronbach's alpha indicators were between 0.69 and 0.93. A Confirmatory Factor Analysis—CFA was conducted. Item loadings into each dimension, the consistency of the items of each subscale, and the impact of (removing or maintaining) each item on the subscale consistency were inspected. The analyses also included measuring the variance inflation factors (VIF)[36], the Average Variance Extracted (AVE)[37] , and the Composite Reliability (CR)[38].

Then, the hypothesized model using structural equation modeling was tested. Parameter estimates were computed using a maximum likelihood estimation method, while a model fit was evaluated using the following criteria: a root mean square error of approximation (RMSEA) of 0.08 or less, an upper RMSEA 90% confidence interval bound of 0.08 or less, a comparative fit index (CFI) and a Tucker-Lewis index (TLI) of 0.90 or more, and a standardized root mean squared residual (SRMR) of 0.08 or less. Factor loadings of each item, the modification indices, the presence of cross-loadings, and inter-item correlations were inspected. The test of the structural model included estimates of the path coefficients, which indicated the strengths of the relationships between the variables; following guidelines by Cohen[39], standardized coefficients as measures of effect size were interpreted (weak ($|0.10| < \beta < |0.29|$), moderate ($|0.30| < \beta < |0.49|$), or strong ($|0.50| < \beta < |1|$). Also estimated were the R^2 values which represent the amount of variance explained by the independent variables[40]. Together, the R^2 and the path coefficients (loadings and significance) indicated how well the data support the hypothesized model.

4. Results

4.1. Preliminary analyses and results

Table 1 shows means, standard deviations, Skewness, and Kurtosis among all the variables, and the correlations between all the measures investigated in the study. The results indicated that almost all these measures were related with the exception of ANX and SP. In this sample, the experience of sensing a social entity when interacting with a robot (SP) is independent of the level of anxiety (ANX) in interacting with it and viceversa.

Table 1. Means (standard deviations) and bivariate correlations among variables.

	M (SD)	Skewness	Kurtosis	1	2	3	4	5	6	7	8	9	10
ANX	1.96 (0.73)	0.78	0.46	1									
ATT	3.83 (0.96)	−0.63	−0.18	−0.26**	1								
ITU	3.15 (1.17)	−0.07	−0.93	−0.36**	0.75**	1							
PAD	2.55 (0.86)	0.04	−0.83	−0.16**	0.62**	0.65**	1						
PENJ	3.51 (0.93)	−0.34	−0.38	−0.26**	0.71**	0.68**	0.63**	1					
PS	2.85 (1.11)	0.21	−0.72	−0.15**	0.55**	0.55**	0.56**	0.76**	1				
PU	3.28 (1.11)	−0.15	−0.96	−0.25**	0.81**	0.74**	0.71**	0.77**	0.71**	1			
SI	3.12 (1.08)	−0.05	−0.67	−0.12*	0.58**	0.48**	0.47**	0.54**	0.44**	0.66**	1		
TRST	3.05 (1.03)	−0.12	0.14	−0.14**	0.59**	0.55**	0.63**	0.62**	0.56**	0.69**	0.64**	1	
SP	1.54 (0.73)	1.55	1.96	0.04	0.24**	0.29**	0.41**	0.42**	0.43**	0.35**	0.28**	0.34**	1

Note: ANX: Anxiety; ATT: Attitude; ITU: Intention to Use; PAD: Perceived Adaptability; PENJ: Perceived Enjoyment; PS: Perceived Sociability; PU: Perceived Usefulness; SI: Social Influence; TRST: Trust; SP: Social Presence. The response scale is from 1 = totally disagree; up to 5 = totally agree. * = $p < 0.05$; ** = $p < 0.01$.

A CFA was run in order to observe the reliability and validity of the data by examining how well the measured variables represented the latent variables. The model provided an acceptable fit to the data, $\chi^2(389) = 855.54$, $p = 0.001$; RMSEA = 0.06 (90% CI: 0.06, 0.07); CFI = 0.94; TLI= 0.93; SRMR = 0.03.

The analyses also included measuring Collinearity Statistics of the latent variables that was observed using Variance Inflation Factors (VIF). VIF for the data showed in all cases values lower than 5.35. The Average Variance Extracted (AVE) for each latent variable was equal or higher than 0.50. Thus, convergent validity was established. The values for the Composite Reliability (CR) were greater than 0.70.

4.2. Testing the model

The model had a sufficient fit to the data: $\chi^2(414) = 1107.72$, $p < 0.001$; RMSEA = 0.072 (90% CI: 0.067–0.078); CFI = 0.91; TLI = 0.90; SRMR = 0.07. All the 31 items could be retained (see **Figure 2**).

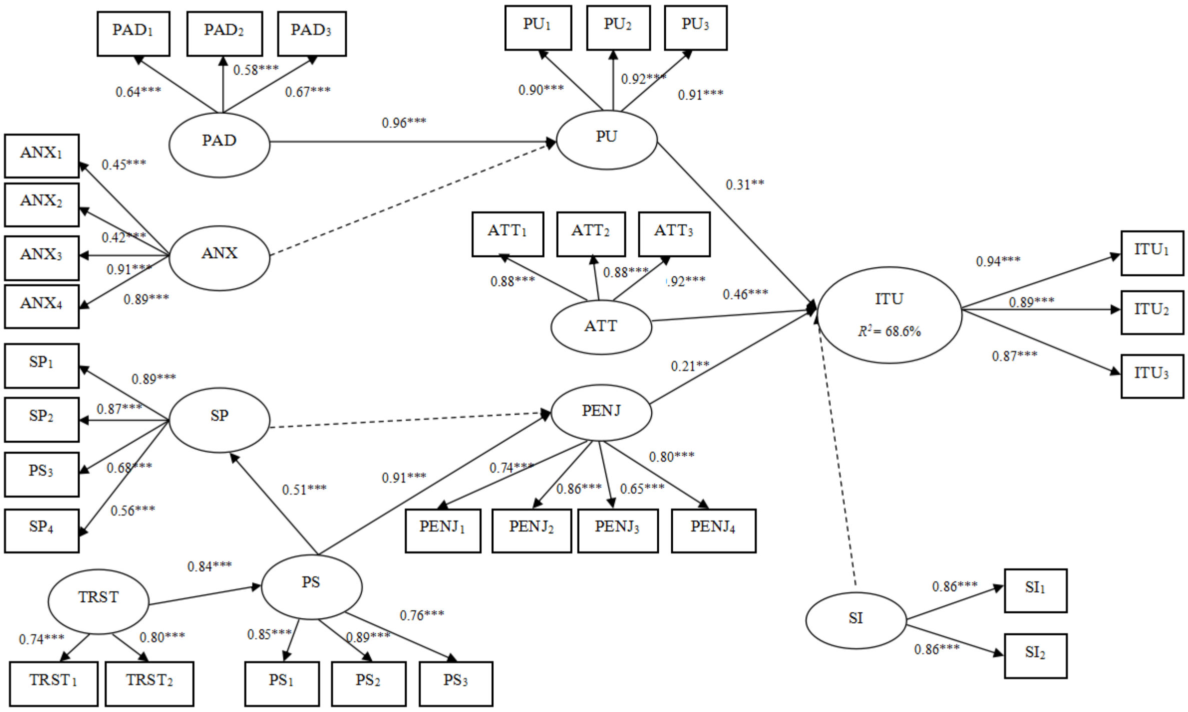

Figure 2. The model for the intention to use ER by learning support teachers.

Note: ANX: Anxiety; ATT: Attitude; ITU: Intention to Use; PAD: Perceived Adaptability; PENJ: Perceived Enjoyment; PS: Perceived Sociability; PU: Perceived Usefulness; SI: Social Influence; TRST: Trust; SP: Social Presence. All the variables were correlated. All the coefficients were standardized. All the coefficients associated with the solid lines were significant. All the coefficients associated with the dashed lines were not significant. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

As shown in **Figure 2**, the learning support teachers' ITU in their work context was weakly and positively associated with a greater PU (confirming H1a), ATT (confirming H1b), and Perceived Enjoyment (confirming H1c), but not with SI (rejecting H1d). PU was significantly and positively associated with PAD (confirming H2a), but not negatively associated with teachers' ANX (rejecting H2b). PENJ was positively associated with PS (confirming H3b) that was, in turn, positively associated with TRST (confirming H4). Furthermore, PS was positively associated with SP, in line with H5. However, SP was not positively associated with PENJ, in contrast with H3a.

5. Discussion

In this study, the validation and the development of a version of the UTAUT model, the Almere model for the study of acceptance of ER among learning support teachers, was run. Results showed that the model fit within the parameters explaining a good percentage of variance (i.e., 68.6%). This was the first study using a sample of learning support teachers for testing a model of acceptance of ER.

In the learning support teachers' intentions to use ER with students with disabilities, the strongest direct effects were exerted by positive PU (e.g., "I think a robot is useful to me in my work"), and positive ATT (e.g., "A robot would make my job more interesting"), in line with H1a and H1b, respectively. Other studies confirmed the importance of attitudes and perceived usefulness for increasing the intentions to use robotics, particularly for jobs that demand social skills as in case of leaning support teaching[3,12,15,17,41,42]. For instance, presenting an acceptance model to study robotics applications in social context, Han and Conti[12] found that both PU and ATT had a strong relationship with the intention to use robots. Conti et al.[16] did not find the predicted relationship between attitudes and intentions to use. However, the sample of Conti and colleagues did not comprise learning support teachers, nor did they use structural equation modeling.

Moreover, in this study, PENJ (e.g., "I find a robot fascinating") also had a significant role in increasing teachers' intentions to use ER in the near future with their students, in line with H1c. In other studies, PENJ was a crucial determinant for the intention to use robotics[12,15,43]. Furthermore, in line with Conti and colleagues[16] but contrary to the prediction (H1d), SI (e.g., "I think the staff would like me to use a robot in my work") had no association with the teachers' intentions to use ER. SI represents the degree to which teachers believed that others (e.g., colleagues) consider it to be important to use ER. The role of social influence is considered important in the models explaining technology acceptance and utilization, because it can improve feelings of users' internalization and identification that, in turn, have a positive influence on the acceptance and use of a system[44]. The non-significant and unexpected results can be explained by the fact that ER is not widespread in Italian educational contexts and, therefore, there is no precise social representation of what others significant persons and colleagues think about it, or about their experiences with it[4].

Furthermore, these results showed that PU was strongly associated with how much teachers perceived the robot to be adaptable, flexible, and easily tailored to the specific needs of students, and the work context (PAD, e.g., "I think a robot can be adapted to what I need in my work"), in line with H2a. These results are in line with other study results[4,12,16]. Evidence indeed suggests that people's acceptance of robots may, to some extent, depend on the domain in which the robot is used[17,45].

Furthermore, in this study, learning support teachers' anxiety toward the use of ER (e.g., "I find a robot in my work scary") was not related to PU (in contrast with H2b). In other words, ANX was not associated with a rejection of ER per sé, in line with other studies[15]. These results could indicate that teachers might be scared into making errors but this might not affect their perception that robotics is useful.

In addition, the results showed that PENJ was not associated with SP (e.g., "When interacting with a robot I felt like I'm talking to a real person," in contrast with H3a), but strongly and positively related with PS (e.g., "I think the robot is nice; it is a pleasant interaction partner," in line with H3b). In other words, learning support teachers enjoy ER if the robot performed in a socially competent way. However, teachers perceive ER as a clever and fun tool regardless of the robot's capacity to appear animate. In contrast to these results, Conti and colleagues[16] found a positive association between SP and PENJ. Conti and colleagues used a human-like robot (NAO) in their classes whereas, in this study, different robotic systems were used, such as LEGO Mindstorms EV3, Bee/Blue-Bot, Ozobot, and Lego Wedo. This broad experience may have made this study's teachers more favourable toward ER regardless of the type of robotic system used, and thus explaining the missing link between SP and PENJ. Furthermore, in this study, PENJ was correlated to PS more than to SP, in line with other studies using a sample of teachers[46]. This is not surprising considering that perceptions that a robot has social skills which enable it to function as an assistive device is relevant for a support teacher.

Moreover, PS was positively associated to the levels of trust (e.g., "I would trust a robot if it gave me advice for my work") in line with H4 and with literature results[12]. Finally, SP was positively associated with PS (in line with H5). Also, these results are not surprising considering that the use of robots requires users to feel confident and at ease when interacting with it. This psychological comfort is increased if a robot has a realistic humanlike appearance, if its behaviour conforms to human social norms, and if it has the capacity to be socially and emotionally responsive[47].

ER is a significant tool for offering adequate support to students with disabilities[48]. However, many teachers are unaware of the numerous benefits of ER and, only recently, have started to be involved in specialized training programs in educational institutions[49]. Understanding learning support teachers' acceptance of ER will enable to design more effective training courses for in service teachers and for in training teacher to foster the adoption of ER not only in standard curricula, but also in curricula dedicated to students with disabilities. As a whole, these results also intersect with those found on the acceptance of service robot[49,50].

There are some important limitations in this study. First of all, the convenience sample is relatively small, leading to a low representativeness of the sample. Using a convenience sampling strategy in the data collection makes it challenging to reach people with more negative attitudes toward ER. Furthermore, the study was conducted in just one country, so the findings may not be generalizable to other countries. Future research should explore the same topic in a more representative sample. Multigroup analyses could be used to test whether differences exist across countries or teachers past experiences with ER. Furthermore, the cross-sectional nature of the study poses constraints on the ability to draw causal inferences. Moreover, in some aspects this model still needs further research. For instance, the usage was not measured, while attitude, perceived usefulness, and perceived adaptability dimensions, which are important factors in this model, needs further investigation, and they could be explored in different domains of disabilities[4,17,45]. Also, future studies should validate alternative models exploring the impact of further variables on the acceptance of ER. In particular, it may be useful to consider the role of the perceived ease of use or similar factors of effort expectations. Furthermore, this study only examined learning support teachers' acceptability of ER, and did not examine the impact of ER on student learning outcomes.

Despite the aforementioned limitations, this study is one of the few studies to apply structural equation modeling to the UTAUT model of Conti and colleagues[16] for exploring acceptance of ER among learning support teachers. The study provides some insights concerning the factors that are related to the learning support teachers' acceptance of ER. This information can be used to develop interventions and policies that promote the use of ER in special education classrooms, considering the ER potential to provide several benefits for students with disabilities. The use of ER in special education classrooms is still relatively new, and more research is needed to understand how to best implement ER in such settings.

Author contributions

Conceptualization, SDB; methodology, SDB and AG; software, SDB and AG; validation, SDB, MP, EM, MM and AG; formal analysis, SDB and AG; investigation, SDB, EM and MM; resources, SDB and MP; data curation, SDB and AG; writing—original draft preparation, SDB; writing—review and editing, SDB; visualization, SDB; supervision, SDB and MP; project administration, SDB and MM. All authors have read and agreed to the published version of the manuscript.

Conflict of interest

The authors declare no conflict of interest.

Notes

1. Other constructs were not considered or not reported in the analyses of Conti and colleagues (i.e., the actual use of a robot, the facilitating condition, and perceived ease of use concerning a robot).

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Appendix

Table A1. List of latent variables.

Latent variable	Symbol	
Anxiety	ANX	ANX_1
		ANX_2
		ANX_3
		ANX_4
Attitude	ATT	ATT_1
		ATT_2
		ATT_3
Intention to Use	ITU	ITU_1
		ITU_2
		ITU_3
Perceived Adaptability	PAD	PAD_1
		PAD_2
		PAD_3
Perceived Enjoyment	PENJ	$PENJ_1$
		$PENJ_2$
		$PENJ_3$
		$PENJ_4$
Perceived Sociability	PS	PS_1
		PS_2
		PS_3
Perceived Usefulness	PU	PU_1
		PU_2
		PU_3
Social Influence	SI	SI_1
		SI_2
Trust	TRST	$TRST_1$
		$TRST_2$
Social Presence	SP	SP_1
		SP_2
		SP_3
		SP_4