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ASSISTIVE TECHNOLOGY IN THE PRACTICE OF EDUCATIONAL REHABILITATORS IN CROATIA

ASISTIVNA TEHNOLOGIJA U PRAKSI EDUKACIJSKIH REHABILITATORA U HRVATSKOJ

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ABSTRACT

Assistive technology (AT) is considered a comprehensive ecosystem of experts, products, and services necessary for safe and effective implementation. Educational rehabilitators acquire basic competencies for the use of AT in everyday practice during their higher education, with the goal of achieving individual educational and rehabilitation objectives. However, in the Republic of Croatia, there are still no clear or uniform guidelines in the field of AT, which is often addressed in a fragmented manner. This paper presents part of the results of a study conducted at the beginning of 2025 by the Working Group for Assistive Technology at the Croatian Chamber of Educational Rehabilitators, involving a sample of 60 educational rehabilitators from various systems (education, social care, healthcare, etc.). The study was conducted using an online questionnaire designed specifically for this research.

The results show that professionals most often face a lack of time to work with AT, insufficient professional support and mentoring, and limited resources and equipment. AT is frequently implemented as part-time work, with preparation and planning often taking place outside working hours. Key areas highlighted include the need for continuous professional development, digital literacy, quality assessment of user needs, teamwork, creativity, thorough knowledge of users' functional abilities, expert motivation, and adequate organisational conditions. Experts with less experience in using AT gave significantly lower evaluations of their readiness to use AT, readiness to carry out AT assessment, expertise in

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working with AT, and competence to adapt technology to the specific needs of users than experts with over 20 years of experience. The findings clearly indicate the need for systematic investment in developing the competencies of educational rehabilitators, improving access to equipment and AT offices, and strengthening institutional and financial support.

Keywords: assistive technology, educational rehabilitators, competencies in AT services

SAŽETAK

Asistivna tehnologija (AT) smatra se sveobuhvatnim ekosistemom stručnjaka, proizvoda i usluga potrebnih za njenu sigurnu i učinkovitu primjenu. Edukacijski rehabilitatori tokom visokog obrazovanja stiču osnovne kompetencije za primjenu AT-a u svakodnevnoj praksi, s ciljem ostvarivanja individualnih obrazovnih i rehabilitacijskih ciljeva. Međutim, u Republici Hrvatskoj još uvijek ne postoje jasne i jedinstvene smjernice u području AT-a, koje se često razmatra fragmentirano. U ovom radu prikazan je dio rezultata istraživanja koje je početkom 2025. godine provela Radna grupa za asistivnu tehnologiju pri Hrvatskoj komori edukacijskih rehabilitatora, na uzorku od 60 edukacijskih rehabilitatora zaposlenih u različitim sistemima (obrazovanju, socijalnoj zaštiti, zdravstvu i dr.). Istraživanje je provedeno primjenom online upitnika posebno kreiranog za potrebe ovog istraživanja.
Rezultati pokazuju da se stručnjaci najčešće suočavaju s nedostatkom vremena za rad s AT-om, nedovoljnom stručnom podrškom i mentorstvom te ograničenim resursima i opremom. Primjena AT-a često se realizira kao dodatni dio radnih obaveza, dok se priprema i planiranje nerijetko odvijaju izvan radnog vremena. Kao ključna područja istaknuti su potreba za kontinuiranim stručnim usavršavanjem, digitalnom pismenošću, kvalitetnom procjenom potreba korisnika, timskim radom, kreativnošću, detaljnim poznavanjem funkcionalnih sposobnosti korisnika, motivacijom stručnjaka i odgovarajućim organizacijskim uvjetima. Stručnjaci s manje iskustva u primjeni AT-a značajno su niže procijenili svoju spremnost za primjenu AT-a, spremnost za provođenje procjene za AT, stručnost u radu s AT-om i kompetentnost za prilagođavanje tehnologije specifičnim potrebama korisnika u odnosu na stručnjake s više od 20 godina iskustva. Rezultati jasno ukazuju na potrebu za sistemskim ulaganjem u razvoj kompetencija edukacijskih rehabilitatora, poboljšanjem dostupnosti opreme i kabineta za AT te jačanjem institucionalne i finansijske podrške.

Ključne riječi: asistivna tehnologija, edukacijski rehabilitatori, kompetencije u pružanju usluga asistivne tehnologije

INTRODUCTION

According to the Report on Persons with Disabilities in the Republic of Croatia (2025), as of 15th September 2025, there were 675,213 persons with disabilities living in the Republic of Croatia, of whom 369,191 were male (54.7%) and 306,022 were female (45.3%), comprising 17.5% of the total population. The largest number of persons with disabilities are in the 65+ age group (47%), while 40.6% are of working age (20–64 years). The most common types of impairments among persons with disabilities, based on the Act on the Register of Persons

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with Disabilities (OG 63/22), are multiple impairments, impairments of the locomotor system, and impairments of other organs and organic systems.

The Report presents data on the use of aids by persons with disabilities in the Republic of Croatia, with the most used being visual and typhlotechnical aids, aids for diabetes, and aids for the urogenital system (Benjak, 2025).

In Croatia, there is still no registry of children, young people, or adults who require any form of assistive technology (AT). It is estimated that more than 4,000 children with developmental disabilities in Croatia need some form of augmentative and alternative communication.

According to the Occupational Standard – Educational Rehabilitator (Ministry of Science and Education of the Republic of Croatia, 2022), the role is defined as follows: „Educational and rehabilitation activities include screening the target population and determining the need for comprehensive support; preventing secondary difficulties and social exclusion; assessing developmental milestones, functioning and support needs, characteristics of the living environment and quality of life; and evaluating appropriate forms of educational and rehabilitation programmes and rehabilitation technology (AT) for the target population in all areas of work. Furthermore, the methodology of the educational rehabilitator's work includes teaching children and students, developing and implementing individualised educational and rehabilitation plans and programmes for the target population and their living environment in all areas of work, providing counselling related to the target population, and evaluating all methods of intervention. The areas of work for educational rehabilitators are early childhood intervention, upbringing and education, training for life and work, professional rehabilitation, employment and housing, the third age, and transitions within and between systems (support). Educational rehabilitators work with all age groups of the target population in the education system, social welfare, health, professional rehabilitation and employment, the civil sector, and independent practice."

According to the Qualification Standard for the university master's degree in educational rehabilitation (Ministry of Science, Education and Youth of the Republic of Croatia, 2024), the set of learning outcomes for Assistive Technology includes the following outcomes acquired by educational rehabilitators: "Create and assess the assistive technology needs of the target population. Integrate the results of the assessment and select appropriate assistive technology. Implement and evaluate the application of assistive technology in all areas of work with the target population. Create software and/or hardware solutions, independently or as part of a team."

Competences in the field of AT are acquired by educational rehabilitators at the University of Zagreb, Faculty of Education and Rehabilitation, through the university graduate study programme in Educational Rehabilitation. In the mandatory course "Assistive and Rehabilitation Technology", emphasis is placed on the assessment of needs for AT, the application of AT in all systems and environments, monitoring, evaluation and adaptation of AT use, education of users, families and professionals from other disciplines, adaptation of the physical environment, and practical activities within the ERF Assistive Technology Laboratory (AT Lab), cooperating institutions, and in collaboration with experienced mentors in practice. Additionally, AT is covered within the mandatory course "Electronic Aids and Techniques in the Rehabilitation of Visually Impaired Persons". Topics related to AT are also

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included in other courses within the Educational Rehabilitation study programme at the University of Zagreb, Faculty of Education and Rehabilitation.

Awareness of AT use is now extremely widespread, not only among users but also among experts from various disciplines. Recognition of the importance and use of AT has resulted from technological progress, global digitalisation, and increasing social sensitivity towards the inclusion of people with disabilities. Despite greater awareness of the needs of people with disabilities and children with developmental disabilities to use AT, as well as the popularisation of this topic among the general public, numerous challenges remain that affect the quality and implementation of services related to AT (Ahmed, 2018; Layton et al., 2023; McGregor & Pachuski, 1996; McNicholl et al., 2021).

The exceptionally rich and diverse range of AT instruments, from highly sophisticated communication aids to sensor-controlled prostheses, requires transdisciplinary cooperation. Precisely because of the current multidisciplinary approach to the issue of AT, there is a lack of a unified framework to provide guidelines for assessing user needs, developing and designing AT solutions, and ultimately implementing and evaluating the impact of the recommended tools (Miesenberger et al., 2017; Steel et al., 2012; Hoogerwerf et al., 2017; de Witte et al., 2018).

The lack of standardisation in the field of AT brings several challenges that affect users, professionals, and the wider community. Users often face uneven access to quality solutions, with outcomes frequently depending on the professional or institution they rely on. Different approaches and criteria for the application of AT further complicate cooperation between professionals from various disciplines, which can lead to fragmented and uncoordinated solutions. In addition, the lack of standardisation significantly slows the regulation of the quality and safety of the aids themselves, as well as their compliance with legal and ethical standards, thereby jeopardising the effectiveness and reliability of this field in rehabilitation (de Witte et al., 2018; Hoogerwerf et al., 2017).

International research consistently indicates that successful AT implementation depends on the availability of equipment and technical support, dedicated time for assessment and planning, and clear service pathways within institutions, rather than on individual initiative alone (Arthanat et al., 2017; Copley & Ziviani, 2004; Ogondiek, 2025).

The Working Group for Assistive Technology was established at the Croatian Chamber of Educational Rehabilitators in June 2024. One of the goals of the Working Group is to adopt a National Framework for Assistive Technology. An initial activity was to map the capacities of educational rehabilitators in the assessment and AT use at the national level. The data obtained will provide insight into the needs of educational rehabilitators in the field of AT.

Given the limited data on the competencies of educational rehabilitators in the field of AT, the aim of this study is to gain insight into the knowledge and competencies of educational rehabilitators in AT, their working conditions, and challenges in practice in the Republic of Croatia, with the goal of developing guidelines for establishing work standards for educational rehabilitators in the field of AT.

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MATERIAL AND METHODS

Study design

For the research, a questionnaire was created using Google Forms, containing 25 questions on sociodemographic data (gender, county of employment, employment system, years of work experience, years of experience in the use of AT), working conditions, the institution's provision of assistive technology, the number of users they work with, daily workload in AT, the type of AT used, challenges in using AT, and four questions on self-perceived competence in the use of AT, conducting AT assessments, levels of expertise in working with AT, and competence in adapting AT to users' needs. Cronbach's alpha ($\alpha = 0.91$) for the four questions on self-perceived competence indicates very strong internal consistency.

One open question asked which competencies participants consider important for effective assistive technology use in practice.

The link to the questionnaire was sent by email to all members of the Croatian Chamber of Educational Rehabilitators (HKER) and via the HKER Facebook group. HKER currently has 1,700 members. The questionnaire was available for completion in March and April 2025.

Ethical Approval and Consent Statement

The research strictly adhered to the ethical principles of scientific practice, the principles of protecting the dignity and other rights of all participants in accordance with the Code of Ethics of the Committee for Ethics in Science and Higher Education and the Code of Ethics of the University of Zagreb. All written research results are anonymous and do not contain any private or confidential information about the research participants. Participants are informed about the aim of the questionnaire and research at the beginning of the questionnaire. Participation in the questionnaire was voluntary, and participants could withdraw at any time.

Participants

There was a total of 60 participants, educational rehabilitators, members of HKER who use AT in their work. Participants live in different parts of Croatia, with most of them living in the capital city of Croatia.

Data processing methods

The quantitative part of the questionnaire was analysed using the Statistical Package for the Social Sciences (IBM SPSS v.31), employing descriptive statistics (frequencies and percentages) and nonparametric tests (Kruskal-Wallis test and post hoc Dunn's tests with Bonferroni correction) to assess differences in self-evaluation of readiness to carry out an assessment for the selection of AT, expertise in working with AT, and competence to adapt technology to the specific needs of users among six groups based on years of experience with AT. A nonparametric test was used because, according to the Kolmogorov-Smirnov test, the data were not normally distributed ($p < 0.001$). Qualitative data were analysed using thematic analysis.

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Responses to one open question about competencies that participants consider important for effective assistive technology use in practice were also analysed using qualitative thematic analysis.

RESULTS

Regarding work experience in AT, the largest proportion of respondents have 6–10 years of experience (30%), while 25% have 3–5 years of experience in the field of AT (Table 1).

Table 1. Frequencies of years of experiences and self-perception of competencies in some AT services

Variable		N	%
Years of experience using AT	0-2	9	15.0
	3-5	15	25.0
	6-10	18	30.0
	11-15	9	15.0
	16-20	6	10.0
	20+	3	5.0
Self-perception of competence in using AT 1- insufficient 5- excellent	1	0	0
	2	4	6.7
	3	24	40.0
	4	20	33.3
	5	12	20.0
Self-perception of competence in conducting assessments for the selection of AT 1- insufficient 5- excellent	1	7	11.7
	2	11	18.3
	3	25	41.7
	4	11	18.3
	5	6	10.0
Self-perception of level of expertise in working with AT 1-beginner 5-expert	1	1	1.7
	2	9	15.0
	3	31	51.7
	4	12	20.0
	5	7	11.7
Self-perception of competence in adapting technology to the specific needs of the user 1- insufficiently competent 5-fully competent	1	2	3.3
	2	11	18.3
	3	29	48.3
	4	13	21.7
	5	5	8.3

Responses to the question on readiness to use assistive technology (AT) in practice, based on educational experience, were recorded on a scale from 1 to 5, where 1 indicated “insufficient” and 5 “excellent”. A medium level of readiness was reported by 40% of participants. Higher levels of readiness were also common, with 33.3% of respondents rating their readiness as very good and 20% as excellent. No participants reported insufficient preparation.

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In terms of self-assessed competencies in conducting an AT assessment, the largest proportion of participants (41.7%) reported moderate competence. Lower competence levels (ratings 1 and 2) were reported by 30% of participants, whereas 28.3% indicated higher levels of competence (ratings 4 and 5).

Participants' self-assessed level of expertise in AT practice was measured on a scale from 1 (beginner) to 5 (expert). More than half of the respondents (51.7%) rated their expertise as moderate (level 3). Higher levels of expertise (levels 4 and 5) were reported by 31.7% of participants, while lower levels (levels 1 and 2) were reported by 16.7%.

Competence in adapting technology to specific user needs was also assessed. The largest proportion of participants (48.3%) reported a moderate level of competence. Lower levels of competence were reported by 21.6% of respondents, while 30% indicated higher levels of competence (levels 4 and 5).

Table 2 shows the results of the Kruskal-Wallis test for differences between competencies in a specific area of AT with respect to years of experience using AT.

Table 2. Differences between competencies in a specific area of AT with respect to years of experience using AT

Variable	Years of experience using AT	N	Mean rank	H	p
Self-perceived competence in using AT	0–2	9	21.61	11.790	.038
	3–5	15	26.90		
	6–10	18	31.06		
	11–15	9	29.83		
	16–20	6	40.17		
	>20	3	54.50		
Self-perceived competence in conducting assessments for AT selection	0–2	9	20.00	17.107	.004
	3–5	15	27.37		
	6–10	18	27.47		
	11–15	9	34.00		
	16–20	6	44.42		
	>20	3	57.50		
Self-perceived level of expertise in working with AT	0–2	9	21.89	16.388	.006
	3–5	15	27.93		
	6–10	18	28.64		
	11–15	9	28.56		
	16–20	6	45.08		
	>20	3	57.00		
Self-perceived competence in adapting technology to users' specific needs	0–2	9	23.17	15.163	.010
	3–5	15	26.97		
	6–10	18	29.33		
	11–15	9	28.22		
	16–20	6	43.50		
	>20	3	58.00		

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Table 3 Post-hoc Dunn's tests with Bonferroni correction

Variable	Years of experience	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Self-perception of competence in using AT	0-2 – 20+	-32.889	10.989	-2.993	0.003	0.041
Self-perception of competence in conducting assessments for the selection of AT	0-2 – 20+	-37.500	11.125	-3.371	<0.001	0.011
Self-perception of level of expertise in working with AT	0-2 – 20+	-35.111	10.730	-3.272	0.001	0.016
Self-perception of competence in adapting technology to the specific needs of the user	0-2 – 20+	-34.833	10.862	-3.207	0.001	0.020
	3-5 – 20+	-31.033	10.305	-3.012	0.003	0.039

Asymptotic significance (2-sided tests) are displayed. The significance level is 0.050.
a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

A significant Kruskal-Wallis test indicated differences in self-evaluation of competencies to use AT ($H(5) = 11.79$, $p = 0.038$), competence to carry out an AT assessment and selection ($H(5) = 17.107$, $p = 0.004$), expertise in working with AT ($H(5) = 16.388$, $p = 0.006$), and competence to adapt technology to the specific needs of users ($H(5) = 15.163$, $p = 0.01$) among six groups based on years of experience with AT. Post hoc Dunn's tests with Bonferroni correction revealed that participants with 0–2 years of experience had significantly lower evaluations of competencies to use AT ($p < 0.041$), competencies to carry out AT assessment ($p < 0.011$), expertise in working with AT, and competence to adapt technology to the specific needs of users ($p < 0.02$) than experts with 20+ years of experience. Participants with 3–5 years of experience had significantly lower competence to adapt technology to the specific needs of users ($p < 0.039$) than those with 20+ years. No significant differences were found between other groups ($p > 0.05$).

Assistive technology in educational rehabilitation practice

Table 4 shows implementation of AT services in educational rehabilitation practice. Most participants reported implementing the adaptation and adjustment of AT devices to users' needs (61.67%), as well as monitoring and evaluating the effectiveness of AT solutions (50%) and using them in group activities (50%).

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A total of 41.67% of participants reported conducting assessments of AT needs, while 38.33% provided support to other professionals in implementing AT solutions. Training and education on the use of AT were reported by 28.33% of participants, and 20% indicated involvement in AT-related rehabilitation, training, or implementation.

Among the 60 participants, 13.33% reported providing AT services on a full-time basis. Part-time provision was reported by 25% of respondents, while 28.33% provided AT services occasionally. Additionally, 30% reported providing AT services outside regular working hours.

Regarding the number of users, the largest proportion of participants reported providing AT services daily to 3–5 users (45%) or 0–2 users (30%).

Table 4. Using AT in educational rehabilitation practice

Variables		N	%
What services related to AT do you provide within the framework of educational and rehabilitation practice?	Individual work with users	1	1.67
	Training and education for the use of AT	17	28.33
	AT needs assessment	25	41.67
	Adaptation and adjustment of the AT asset to the specific needs of the user	37	61.67
	Support to other experts for the implementation of AT means in working with the user	23	38.33
	Monitoring and evaluation of effectiveness	30	50
	Application of AT means in group activities	30	50
	Rehabilitation/training for the application of AT	12	20
	Consulting for the procurement of AT funds	4	6.67
How much working time do you spend preparing and planning rehabilitation treatment, adjusting AT devices, etc.?	Part-time	15	25
	Outside working hours	18	30
	We do not have working hours for this, it is expected to be done outside of working hours	1	1.67
	Occasionally	17	28.33
	Full-time	8	13.33
	Not at all	1	1.67
Number of users you provide AT services to daily	0 - 2	18	30
	3 - 5	27	45
	6 - 8	8	13.33
	I cannot estimate	7	11.67
Do you have an AT cabinet (specialized and specially equipped space) in your institution?	Yes	11	18.3
	No	46	76.67
	Other (The office is equipped with some equipment, We don't have a bass office, but we do have a room for typhlotechnics, yes., I usually carry the equipment with me and visit the users' homes	3	5

Table 5 shows the forms of AT that educational rehabilitators use in their work. Most respondents state that they use augmentative and alternative communication tools (AAC, 63.33%) and learning and cognition support tools (38.33%) almost constantly in their work,

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while the fewest use domotics (90% respondents do not use them at all). In order, the tools that are not used at all or are rarely used in work are those intended for people with hearing impairments, tools for people with visual impairments, tools for workplace adaptations and self-care, and tools for recreation and leisure.

Table 5. *Categories of assistive technology that educational rehabilitators use in their work*

Categories of AT	n (%)				
	almost all the time	often	occasionally	rarely	do not use
AAC	23 (38.33)	15 (25)	13 (21.67)	5 (8.33)	4 (6.67)
AT for mobility and positioning	7 (11.67)	9 (15)	8 (13.33)	11 (18.33)	25 (41.67)
AT for visual impairment	6 (10)	2 (3.33)	6 (10)	10 (16.67)	36 (60)
AT for hearing impairment	1 (1.67)	1 (1.67)	3 (5)	8 (13.33)	47 (78.33)
AT to support learning and cognition	11 (18.33)	12 (20)	9 (15)	16 (26.67)	12 (20)
Domotics	0	1 (1.67)	0	5 (8.33)	54 (90)
AT for recreation and leisure	2 (3.33)	12 (20)	9 (15)	13 (21.67)	23 (38.33)
AT for self-care	6 (10)	5 (8.33)	6 (10)	13 (21.67)	29 (48.33)
AT for workplace adaptation	5 (8.33)	6 (10)	6 (10)	11 (18.33)	31 (51.67)

Challenges in using assistive technology in educational-rehabilitation practice

The most frequently reported challenges in the implementation of AT are presented in Table 6. The most common challenges included lack of resources or devices (56.67%), limited time for preparation (55%), and insufficient professional support or mentoring (55%). Additionally, 45% of participants reported a lack of time to work with technology. Other reported challenges included difficulties in team collaboration (35%) and adapting technology to users' needs (33.33%). Less frequently mentioned challenges were lack of assessment instruments for AT, insufficient staff awareness, unsupportive institutional environments, and low parental motivation for AT use.

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Table 6. Challenges in using assistive technology in educational-rehabilitation work

Challenges in using assistive technology	n	%
Lack of time to work with technology	27	45
Teamwork	21	35
Time to prepare	33	55
Lack of resources or devices	34	56.67
Instruments for assessing AT use	1	1.67
Insufficient professional support or mentoring	33	55
Insufficient staff awareness	1	1.67
Unsupportive environment within the institution for AT use	1	1.67
Difficulties in adapting technology to specific needs	20	33.33
Parental motivation for AT use	1	1.67
Active role of parents in the process of using assistive technology in the child's daily activities	1	1.67

Competencies required for effective assistive technology use in practice

Forty-six participants (76.67%) stated that they would participate in further training in the field of AT, while 14 participants stated that they might participate.

Participants identified a range of competencies they consider important for effective assistive technology use in practice, as shown in Table 7.

Competencies identified by respondents are continuous professional development, digital literacy, user-centred assessment, teamwork, and organisational support. These topics reflect the multifaceted skill set required for effective AT practice. Continuous professional development and digital literacy highlight the need for professionals to maintain up-to-date knowledge and technical competence, ensuring that assistive technologies are applied accurately and effectively. User-centred assessment emphasizes the importance of understanding individual needs and tailoring interventions accordingly, while teamwork underscores the collaborative nature of AT provision within multidisciplinary settings. Organisational support demonstrates that institutional structures, resources, and systemic backing are critical for translating competencies into practice.

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Table 7. Specific competencies that education rehabilitation experts consider necessary for higher quality work with assistive technology

AREA	THEME	EXAMPLES / QUOTES
1. Education and Professional Development	Continuous education, specific and practical training, micro-learning. Need for ongoing professional development and staying updated with trends. Includes the need for supervision and "on-the-job" training (testing equipment multiple times before recommendation). IT knowledge and skills, digital literacy, understanding software and hardware devices. Developed digital competencies and the ability to apply technology in practice. Assessing user needs, creating individual plans, and problem analysis. Evaluating the effectiveness of equipment and its appropriateness. Understand developmental profiles, user disabilities, and specific needs. Have foundational knowledge (university level) built upon by practice.	• "Trying out specific equipment multiple times before recommending it" • "Continuous professional development" • "Specific training, time allocated for creation (service within the social welfare system)" • "Continuous professional supervision" • "I would like more concrete and practical training sessions" "IT literacy and thorough knowledge of assistive technology" • "Specific knowledge of devices/software" • "Developed digital competencies" • "Interest and IT literacy" • "Technological knowledge and professional support from adequate services" "Skills in assessing AT needs / revision of AT currently in use" • "Ability to write a comprehensive report/finding" • "User needs assessment" "Knowledge of the child's difficulties in order to apply adequate equipment" • "The most important thing is the knowledge for working with children/persons with disabilities acquired at university, as it is a prerequisite for assessment, adaptation, and application of high-tech and low-tech equipment..."
2. Teamwork and Communication	Collaboration with other professionals, openness to different solutions. Good communication within a multidisciplinary team.	• "Good communication with other team members."
3. Creativity and Adaptability	A creative approach to AT application. Flexibility in adapting curricula and devices to meet user needs.	• "Creativity" • "Ability to analyse and solve problems"
4. Motivation, Attitudes, and	Motivation, a passion for AT, and readiness for lifelong learning.	• "Love for AT and awareness of how much AT helps, and of course,

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Values	Openness to new knowledge and self-reflection on one's work.	EDUCATION!" • "Openness to new knowledge, learning, and evaluation of one's own work" • "Ability to analyze and solve problems"
5. Organizational Conditions and Systemic Support	The need for AT specialists within institutions (1–2 per institution). Technical and professional support services that facilitate implementation.	• "Increase the ability of schools to fund necessary training for employees" • "Establishing a high-quality course/education/school for the assessment and application of AT in practice" • "Full-time positions only. In my opinion, every institution should have 1–2 AT specialists (depending on the number of users)."

DISCUSSION

Findings from this study indicate that Croatian educational rehabilitators provide a broad range of AT-related services, among which process of adaptation and adjustment of AT devices, monitoring and evaluation of effectiveness and use of AT in group activities stand out. More than half of the participants provide services linked to assessment and support in implementation of AT. Similar role diversity has been reported among AT service providers and school-based AT specialists, where services typically include assessment, device matching, user training, and follow-up (Arthanat et al., 2017; Lahm, 2003; Lersilp & Lersilp, 2017). The diversity of tasks reported by participants can be largely explained by the highly individualised nature of AT, which requires adaptation to each user's functional abilities, needs, and environmental context. However, only a minority of participants provide AT services full-time, and a substantial proportion reported planning and preparation outside working hours. These findings suggest that AT services may not yet be fully integrated into institutional structures. Instead, their implementation often is time-intensive, encompassing the learning and adaptation of tools, preparation of customised materials, ongoing individualisation, and coordination with multidisciplinary teams (Nordström et al, 2019; Mishra & Nitha, 2022). Studies in inclusive education likewise describe limited allocated time and high workload as key barriers to consistent AT delivery, even when attitudes toward AT are positive (Atanga et al., 2020; Ogondiek, 2025; McGregor & Pachuski, 1996; Ahmed, 2018).

Limited access to equipment and the absence of a dedicated AT cabinet in most institutions represent a structural obstacle that likely restricts opportunities to trial diverse devices and to support maintenance and follow-up. These results may be interpreted considering broader limitations in educational resources, including heterogeneous infrastructure, high equipment costs, insufficient maintenance, and uneven levels of professional training, all of which may constrain the effective implementation of assistive technology across educational contexts

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(Aktan, 2025). Resource constraints and uneven access to devices are repeatedly identified as determinants of AT uptake, particularly where procurement and service pathways are fragmented (Copley & Ziviani, 2004; Vanderpuye & Okai, 2023; de Witte et al., 2018).

The results indicate that greater professional experience is associated with higher levels of competence, with participants reporting increased readiness to use assistive technology, conduct assessments, demonstrate expertise, and adapt devices effectively. Similar patterns have been observed among rehabilitation and educational professionals, indicating that competence develops through structured practice and mentoring in addition to formal education (Kuo & Kosciulek, 2023; Riemer-Reiss, 2003; Gajić & Arsić, 2023; Jurišić et al., 2022). Effective AT implementation requires specialised training that extends beyond general digital skills to include disability-specific knowledge, evidence-based interventions, and competencies in communication, coordination, and collaborative planning, which are often underrepresented in professional preparation programs (Sahoo et al., 2024, Alghazo et al., 2014).

The competency themes identified by participants, that are continuous professional development, digital literacy, user-centred assessment, teamwork, and organisational support, reflect the multifaceted skill set required for effective AT practice. These findings align with literature calling for formalised AT competencies and standards in professional education and continuing development (Drelick et al., 2026; Dalton & Roush, 2010; Jans & Scherer, 2006; Manship et al., 2024; Slaughter et al., 2024; Serbay Zambak et al., 2025; Jurišić et al., 2022). The convergence between participants' experiences and the literature reinforces the argument that AT expertise requires both individual professional capabilities and supportive organisational frameworks to optimise outcomes for users. This interpretation is consistent with recent position papers emphasising the capacity-building role of AT specialists and the need to institutionalise AT services within educational settings (Drelick et al., 2026; Slaughter et al., 2024).

Limitations

This study has several limitations that should be considered when interpreting the findings. First, the relatively small sample size and the use of a non-probability sampling approach limit the generalisability of the results. Second, the data were based on self-reported measures, which may be subject to response bias and may not fully reflect actual competencies and practices. Additionally, the qualitative component was based on brief written responses, which may have limited the depth of the thematic analysis. Finally, the findings are context-specific and reflect the organisation of assistive technology services within the Croatian educational and rehabilitation system, which may differ from other contexts.

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Future research

Since this study provides an initial overview of self-perceived competencies, working conditions, and challenges in AT practice in educational rehabilitators, the next step should involve broader and methodologically stronger investigations that can support the development of national guidelines and organisational models. Future studies should include larger and more representative samples of educational rehabilitators from different regions of Croatia and from different systems, including education, social welfare, healthcare, and private practice. This would enable more precise comparisons across settings and improve understanding of how institutional context influences the availability, quality, and sustainability of AT services.

Future research should go beyond self-evaluation and include objective indicators of competence and practice. In addition to questionnaires, researchers could use case-based assessments, observation of practice, structured competence measures, and documentation of AT assessment and implementation procedures. Such approaches would provide a more comprehensive understanding of educational rehabilitators' actual preparedness to assess, select, adapt, and evaluate AT in real-world settings.

Also, longitudinal research is needed to examine how competencies in assistive technology develop over time and how they are influenced by education, mentoring, supervised practice, and workplace conditions. It would be useful to follow early-career professionals in order to identify the forms of support that most effectively improve confidence and competence in AT service delivery. Such data could help shape induction models, mentoring systems, and continuing professional development pathways.

Future studies should include the perspectives of other key stakeholders, especially users of assistive technology, family members, teachers, school staff, and professionals from other disciplines. Because AT implementation depends on collaboration across systems and on the everyday experiences of users, a broader perspective is necessary to understand barriers and facilitators of successful AT use. Including users' outcomes would also help determine whether professional competence and organisational support are associated with meaningful improvements in participation, communication, learning, and independence.

CONCLUSION

The findings indicate that effective implementation of AT requires clearly defined and standardised competencies encompassing continuous professional development, user-centred assessment, teamwork, and organisational support. These interrelated dimensions demonstrate that the quality of AT practice depends not only on individual professional expertise but also on the presence of structured systemic frameworks that enable consistent and effective AT use.

From a systems perspective, frameworks and position papers underline the capacity-building role of AT specialists and the importance of institutionalising AT services within education settings. These directions support Croatian efforts to develop a National Framework for

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Assistive Technology and to strengthen institutional structures, funding mechanisms, and professional roles.

Consistent with the literature, the need for standardisation emerges as a key prerequisite for ensuring quality and coherence in AT services. The development of explicit competency frameworks, the integration of AT into professional education, and the provision of ongoing professional development represent essential steps in this process. In parallel, strengthening institutional capacity through clearly defined professional roles, standardised procedures, and adequate technical and organisational support is critical.

In conclusion, establishing clear standards and systemic structures is fundamental to the development of consistent and high-quality AT practice, enabling its more effective and sustainable implementation across professional contexts.

Ethical approval

The authors declare that this manuscript is an original work and has not been published or submitted elsewhere. All authors have contributed significantly to the study and approved the final version of the manuscript. The authors disclose that generative AI tools were used during manuscript preparation. The authors take full responsibility for the content of the manuscript.

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