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FACTORS INFLUENCING THE NON-USE AND ABANDONMENT OF ASSISTIVE TECHNOLOGY

ČIMBENICI KOJI UTJEČU NA NEKORIŠTENJE I ODBACIVANJE ASISTIVNE TEHNOLOGIJE

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ABSTRACT

Assistive technology is recognised as a necessary tool to improve the quality of life of people with disabilities. The use of assistive technology and the quality of related services varies from country to country. However, in most countries, there are some factors that influence the non-use or abandonment of assistive technology.

This paper aim is to present the results of studies published in the period between 2015 and 2023 on the factors of non-use and/or abandonment of AT published in the articles cited in the Web of Science database. It also presents some results of three studies conducted in Croatia.

The results show that difficulties in not using and abandonment AT appear in different social and cultural settings. Some of the most common factors identified were the health condition of the user, problems with use, inappropriate AT, lack of training of users and experts, lack of support, non-involvement of users in the AT design, etc.

The non-use and abandonment of AT can harm the quality of life of people with disabilities. Many factors can influence AT abandonment. It is necessary to determine which factors influence the non-use and refusal to use assistive devices and which types of AT are most frequently not used. Understanding these factors is the first step in reducing the problem.

Keywords: assistive technology, non-use, abandonment

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SAŽETAK

Asistivna tehnologija prepoznata je kao neophodan alat za poboljšanje kvalitete života osoba s invaliditetom. Korištenje asistivne tehnologije i kvaliteta povezanih usluga razlikuje se od zemlje do zemlje. Međutim, u većini zemalja postoje slični čimbenici koji utječu na nekorištenje ili napuštanje pomoćne tehnologije.

Cilj ovog rada je prikazati rezultate studija objavljenih u razdoblju od 2015. do 2023. godine o čimbenicima neuporabe i/ili napuštanja AT objavljene u člancima citiranim u bazi podataka Web of Science. Prikazani su i neki rezultati triju studija provedenih u Hrvatskoj.

Rezultati pokazuju da se poteškoće u nekorištenju i napuštanju AT pojavljuju u različitim društvenim i kulturnim okruženjima. Neki od najčešćih identificiranih čimbenika bili su zdravstveno stanje korisnika, problemi s korištenjem, neodgovarajući AT, nedostatak obuke korisnika i stručnjaka, nedostatak podrške, neuključenost korisnika u dizajn AT-a itd.

Nekorištenje i napuštanje AT može utjecati na kvalitetu života osoba s invaliditetom. Mnogi čimbenici mogu utjecati na napuštanje AT. Potrebno je utvrditi koji čimbenici utječu na nekorištenje i odbijanje korištenja pomagala te koje vrste AT se najčešće ne koriste. Razumijevanje ovih čimbenika prvi je korak u smanjenju problema.

Ključne riječi: asistivna tehnologija, nekorištenje, odbacivanje AT

INTRODUCTION

Introduction

Assistive technology (hereinafter referred to as AT) enables children with developmental difficulties, people with disabilities, and the elderly to achieve independence, inclusion, and participation in society. The potential of AT has not been fully realized due to barriers to access and use. People with disabilities face complex obstacles during purchase and using AT due to the characteristics of the devices themselves, the environment in which they are used, and broader social barriers (Howard et al, 2020).

A study by the WHO Regional Office for Europe (2021) identified barriers to the availability of AT services that exist in many European countries. Some of these include a lack of training for healthcare professionals, limited information on available assistive technology and funding methods, limited public funding opportunities, lengthy and untimely procedures for obtaining assistive technology, and social stigmatisation. The report states that improving the situation for people who need assistive technology requires a collaborative approach involving all stakeholders, including policymakers, health professionals, carers, and society. The first important step is to confirm the viability of assistive technology both for the person who needs it and for society. In addition, a person-centred approach, and the involvement of people with disabilities in the development of assistive technology are important. Many of the barriers to assistive technology are the result of a limited understanding of the needs and experiences of people with disabilities.

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Objective

The aim of this study was to investigate the factors for non-use and/or abandonment of AT in people with chronic conditions.

METHOD

A search in the Web of Science Core Collection database for articles, reviews and proceedings published in English and in open access from 2015 to 2023 on the topic of "assistive technology" and "abandonment" (N=36) and on the topic of “assistive technology” and “non-use” (N=11). Articles with the topics “robotic*” and “orthotic*” were excluded. The lists overlapped in 5 articles, so that the total number of articles reviewed was 42. 17 peer-reviewed studies that reported factors for abandonment and non-use of assistive devices by users with chronic conditions were selected for the review. Some results of three studies conducted in Croatia on users’ perceptions of barriers to the use of assistive devices are also presented.

RESULTS

Most studies conducted in the 1990s and early 2000s concluded that the non-use rate of AT was around 30% one year after the device was introduced. However, there are other reports of dropout data that vary widely and deviate from the typical dropout rate. The aim of the study conducted by Federici & Borsci (2016) was to investigate the rate and reasons for AT abandonment among Italian ULHS users. 17.9% of the 749 respondents stated that they did not use their AT device, and 40% of this group had never used the device they received. The data suggests that device abandonment may occur due to an inappropriate device or a failure to meet user needs and expectations. Poor design of the device and inconvenience of use were significantly stronger reasons for not using an assistive device among hard of hearing users. Preference for human assistance, deterioration of health or physical condition or improvement of health or physical condition, lack of human assistance, lack of training, and replacement with a better device were significant reasons for abandonment among mobility AT users.

The aim of the research by Sugawara et al. (2018) was to determine the factors that influence the non-use of AT by users of a local reference rehabilitation centre in Sao Paolo, Brazil. 19.38% of users did not use the recommended aids, and 83.5% of users used at least one of the assistive products they received. Wheelchairs with rigid and folding frames, with and without postural supports, and wheelchairs with showers had the lowest rates of non-use, followed by canes for the blind and orthoses for the lower limbs. Orthoses for the upper limbs, knee-ankle-foot orthoses, walking aids, crutches and prostheses for the lower and upper limbs were abandoned more often. It was determined that the user's perception of the importance of their use simultaneous use of several aids, and the completion of rehabilitation treatment affect the use of assistive products. Healthcare professionals should consider the significant correlation between the non-use of devices in case where the user must use several different devices. It is necessary to monitor the use of aids after discharge from rehabilitation treatment, as data show that completion of treatment is of great importance in estimating

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dropout rates. Since it has been shown that the perception of users of assistive devices about the importance of using these devices plays an important role in possible non-use, health and rehabilitation experts must take this into account when counselling users (Sugawara et al., 2018).

Augmentative and alternative communication (AAC) has numerous benefits for children with complex communication needs, still, parents do not always accept these systems. The aim of the research by Moorcroft et al. (2019) is to determine factors that influence to acceptance or abandonment of AAC systems. Participants were 16 speech-language pathologists (SLPs) who had implemented at least one AAC system that was rejected or abandoned by parents of a young child, as well as one system that was accepted. Thematic analysis revealed six themes that describe influences on parental acceptance of AAC systems: view of their child, attitudes about AAC, support networks in the environment, necessary skills and requirements, services provided by SLPs, and specific characteristics of the AAC system. Parental grief and loss were recognized as potential contributors to AAC dropout. To increase acceptance of AAC, authors concluded that SLPs need to consider the needs of a child with complex communication needs, the child's parents, available AAC systems, and their clinical limitations (Moorcroft et al., 2019).

Research conducted by Howard et al. (2020) aimed to identify barriers to the purchase and use of AT for people with chronic conditions. The following analytical themes were defined: assistive technology design and functioning, service delivery, information and awareness, psychological barriers, support networks, and social barriers. Available information and increased awareness are important for overcoming informational, psychological, and social barriers to AT. The use of AT involves the user to a greater extent to enable personalized care that uses the knowledge and experience of the user. The availability of assistive devices should be viewed together with the adaptation of everyday technologies to meet the needs of users (Howard et al., 2020).

Deaf and hard-of-hearing people use various AT devices to compensate for difficulties resulting from hearing loss. The main goal of the research by Jiménez-Arberas et al. (2021) was to assess the psychosocial impact of various aids on deaf and hard-of-hearing people using the Psychosocial Impact of Assistive Devices Scale (PIADS). The results of 291 participants showed that the use of AT had a positive psychosocial effect, although this effect depended on the type of AT. A correlation was found between psychosocial influence and the probability of not using a hearing aid or cochlear implant in the future. The results show that the psychosocial impact of the device should be considered as a relevant variable in the adoption of AT for deaf and hard-of-hearing people.

Li et al. (2021) conducted interviews with 26 individuals with disabilities to identify the factors that affect the use of assistive technology in China. Only about 7% of Chinese people with disabilities can use AT (Li et al., 2021). China has the largest disabled population in the world, but there is a lack of research on how AT is used and perceived in China. For those who used AT, the dropout rate was high**.** The authors determine the following factors: abuse of accessible infrastructure, problems in imitating existing commercial assistive technology, challenges in using AT in social interactions and wrong perceptions of AT (e.g. that assistive devices should overcome inaccessible social infrastructures). Based on the findings, the

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authors make a series of design considerations to close existing AT design gaps (e.g. hand-held versus electronic devices) and improve the social acceptability of AT in China.

The global increase in people with dementia living in the community emphasises the need for innovative eHealth technologies aimed at supporting patients and their informal caregivers in the home environment (Bastoni et al., 2021). The aim of the study by Bastoni et al. (2021) was to gain a thorough understanding of why it is often difficult to implement eHealth technologies in practice, although numerous technologies have been developed to support people with dementia and their informal caregivers at home. The study had two objectives: to provide an overview of the technologies used in informal dementia care and to examine the factors that influence the implementation of these technologies. Based on a search for systematic reviews in five databases, 21 papers were analysed. The most commonly used technology include lifestyle, home health and safety monitoring devices, memory support technology and communication technology**.** The factors identified as influencing implementation relate to the condition of dementia, the characteristics of the technology, the expected/recognised value, and the characteristics of the informal caregiver.

Real-time locating systems have the potential to improve the safety and health of residents with dementia or other cognitive disabilities, the quality of care, and the efficiency of long-term care facilities in residential long-term care homes. Grigorovich et al. (2021) found that barriers to implementation include: a lack of motivation for engagement, technology ecosystem and infrastructure challenges, and myths, stories, and shared understanding.

Wittich et al. (2021) summarise the existing knowledge about variables that influence the use of assistive devices from the perspective of people with deafblindness. Older age was associated with more difficulties in using assistive devices. This effect was related to lower dexterity and higher levels of visual and hearing impairment. The degree of hearing loss and severity of visual impairment also influenced participants' confidence in their ability to use assistive devices such as hearing aids. The order of onset of sensory impairment may also play a role in the willingness or ability to accept a device. It was more difficult to accept or integrate the devices associated with the second impairment into their lives. Individuals who had managed to accept their situation were more successful in integrating technology into their lives and had more competence and confidence in their ability to use technology. Barriers often occurred when participants struggled with anxiety when using devices, particularly around others and outdoors or in public. These fears were related to the general experience of stigmatisation by others and self-stigmatisation. Technology-related variables that may influence the use of the device include the size of the device, the ability to control the volume or the overall sound quality of the device, device malfunctions and the cost of the device. The perception of the person using the device is influenced by the device itself and the context of its use, e.g. in an environment with other people, especially in public.

In the study Boyle et al. (2022) aim was to identify promotors and barriers to the implementation and adoption of Assistive Technology and Telecare for people with dementia and their informal (family and friends) and formal (healthcare professionals) caregivers. The main barriers to the implementation and adoption of AT included: unintended adverse consequences, timing and disease progress, technology anxiety, system failures, digital divide, and lack of access to or knowledge of available AT.

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Limb weights and hand devices, orthoses and exoskeletons can be used to reduce the severity of tremors or improve functional performance. Barriers to their acceptance are mainly influenced by perceptions of privacy, confidence, and functionality/added value. The authors concluded that to promote the accessibility and usability of AT for tremors, an assessment consensus by an interdisciplinary team (users, prescribers, and technicians) is needed to identify potential users and proper AT. Future developments of AT for tremors should improve user comfort using softer, lighter materials and explore new mechanisms to improve wearability and long-term effectiveness (Bhidayasiri et al, 2022)

A study by Zarshenas et al. (2022) explored care providers' perspectives on the benefits, barriers, and facilitators of implementing "Cognitive Orthosis for coOking (COOK)" (Zarshenas et al., 2022, p. 922) for adults with traumatic brain injury (TBI) in clinical contexts and at home. According to the participants, for adults with traumatic brain injury, COOK could potentially be used with individuals with cognitive impairments (TBI and non-TBI) to increase safety and independence in meal preparation and assist healthcare providers. As potential barriers to these activities, limited access to funding, clients' lack of motivation/knowledge and the severity of their cognitive and motor impairments were cited (Zarshenas et al., 2022).

The aim of the study by Sawadogo et al. (2022) was to examine the impact of discontinuing the use of AT for mobility on the six-month incidence of falls in older adults living at home. 102 participants took part in the research. During the six-month follow-up period, 17 serious falls were recorded in participants who optimally used their mobility aids. 12 falls were recorded in those who stopped using the device (57.1%). Factors significantly associated with falls at home were living in an urban area, a score on the Instrumental Activities of Daily Living Scale > 4 and discontinuing the use of mobility aids.

Dos Santos et al. (2022) conducted the research intending to determine factors that influence perceived stigmatization when using two assistive devices for visually impaired people, a white cane, and smart glasses. Eight students were interviewed to explore their experiences and knowledge about disability, visual impairments, AT, and wearable and portable devices. The factor that had a positive impact on participants' perceptions was close relationships with people with disabilities. The aesthetics of the device was seen as an important factor influencing the acceptance or rejection of the device. Devices without negative symbolism but modern aesthetics (smart glasses) were better accepted by the participants than devices with traditional aesthetics and symbolism of visual impairment (white stick). The authors stated that understanding the factors that influence the perceived stigma associated with AT can help designers and developers influence the reduction of assistive non-use and perceived stigma.

Based on a qualitative analysis of the experiences of people with disabilities, experts in the fields of health, kinesiology, design, informatics, engineering, finance, marketing, economics, ethics, product development, and research development, Mitchell et al. (2023) identified six main issues affecting the use of technology in rehabilitation. The authors identified the following issues: financial and non-financial costs associated with AT, the potential of the technology to benefit multiple stakeholders, ease of use of the technology, trust in the technology, and the ability to access the technology. The costs of technology are evaluated against its benefits (and vice versa), trust is used to reduce concerns about the costs of the

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technology and increase belief in the benefits of the technology, ease of use affects the costs of the technology (when it is low) and increases the benefits of the technology (when it is high), and access to the technology is influenced by factors such as cost and availability of evidence of effectiveness. The importance of directly involving users in the development of assistive technology was emphasized to understand the different needs of users and use their knowledge in the development of technology (Mitchell et al., 2023).

The study by Mackey et al (2023) aims to present the views of speech-language pathologists on the use of AAC aids for people with acquired brain injury (ABI) and reflections from life experience. The introduction of AAC was also seen as dependent on the readiness of the individual in terms of the timing of intervention. Cultural overlaps can influence the acceptance and use of AAC. The importance of linking the use of AAC to the person's stated preferences and participation goals is emphasised. Cognitive-behavioural changes in people with ABI and the impact of these changes on the acceptance and use of AAC. Factors related to grief, loss, and adjustment to life with ABI were associated with acceptance of AAC. The risk of giving up AAC when 1:1 support was not associated with AAC use.

An important factor contributing to the high abandonment rates of AT by people with disabilities is the non-participation of users in design or product development. Peters et al. (2023) in their research presented the activities of "The Human Performance and Mobility Maker Lab" (HPML) at the University of Illinois Urbana-Champaign. The laboratory is intended for the development of AT in cooperation with people with disabilities. People with disabilities are the main drivers of innovation at HPML, and the main principle of HPML is: "*Designed by, not for* ".

Users' perception of barriers to the use of AT in Croatia

In a study conducted in Croatia (Pinjatela et al., 2023), parents of children with developmental disabilities and people with disabilities (N=108) who use assistive technology answered the question, among other things, about the degree of independence provided by AT. The results showed that for the largest number of respondents (N=37, 34.26%) assistive technology enables complete independence, but in 23.15% of cases (N=25) despite the use of assistive technology, users have a constant need for someone else's help or supervision when performing activities. 12.96% (N=14) of the respondents' state that they need the help of another person or partial supervision when performing the more difficult activities of most daily activities, while 8.33% of the respondents (N=9) need the help of another person and/or partial supervision during the performance of heavy activities and a smaller part of everyday activities.

When asked about the difficulties they have when using AT, the largest number of respondents (N=34, 14.72%) stated that they have no difficulties when using AT. 7.79% of respondents (N=18) state that their fine/gross motor skills are not developed enough for full or unhindered use as a difficulty when using AT. 6.06% (N=14) state that family members or employees of institutions whose services they use have not undergone training in the use of assistive technology, 7.36% (N=17) state that it is not waterproof, there is a refusal of AT and problems with motivation for its use (N=12, 5.19%) and AT does not sufficiently support the development of abilities (N=8, 3.46%).

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Regarding emotional coping with the use of assistive technology, out of 84 respondents, the feeling of satisfaction and happiness that AT increases their possibilities was expressed by most respondents, 84.52% (N=71). 9.52% (N=8) of respondents answered that it makes them sad that the use of assistive technology is sometimes extremely difficult for me/my child, while 5.95% (N=5) of respondents answered that they sometimes feel uncomfortable because they alone use, or their child uses assistive technology

Of the 93 respondents to the question about satisfaction with the AT being used, the largest number of respondents were satisfied with the assistive technology they use (N=48, 51.61%). 40.86% of the respondents (N=38) answered that they were satisfied with some aspects of AT, and not with some, while 7.52% (N=7) were mostly or completely dissatisfied with the AT they used.

The study presented in the work by Stančić & Pinjatela (2023) involved 76 experts who use AT in their work. The most common difficulty encountered by the experts in obtaining assistive devices was insufficient financial resources (71.79%), then insufficient support from the service (23.08%), difficulties in obtaining the latest versions of certain types of assistive technology (17.95%), and poor availability on the market (16.67%), only one respondent mentioned insufficient information about assistive devices.

When asked about the difficulties experts face when using AT, 85.11% of respondents who answered this open question mentioned inadequate presentation in practice, insufficiently clear instructions for use, the commerciality of AT and therefore insufficient customisation of assistive devices and equipment, user dissatisfaction with AT, inconsistency in the use of AT, delays in use, stigmatisation of users of AT, the environment is not sufficiently sensitised, lack of awareness of the basic rights to appropriate AT, insufficient information for experts and parents, refusal of use by experts and parents, insufficient knowledge and skills for use, high costs of training experts and parents, and weak technical support.

Users of the AT in the study by Bašić & Bilandžić (2023) stated that when purchasing a device, they are often not yet completely confident and independent in its use. It is precisely for this reason that they cite the most common difficulties in using AT and the need for support in various areas. The most common difficulties cited when using AT are lack of adaptation and lack of individualisation. The lack of adaptation of assistive devices to the end user refers to the whole spectrum of problems, such as the lack of appropriate customisation, the lack of optimal operation of assistive devices, etc. (Bašić & Bilandžić, 2023).

To ensure the effective use of AT and minimize the possibility of discarding the assistive device, it is necessary to carry out an adequate assessment of the user's needs with the aim of selecting and possibly adjusting the AT solution. Assessment of needs for AT includes consideration and evaluation procedures to determine which services and devices ensure effective achievement of the goal for the user (Pinjatela & Vinceković, 2023). Assessment of AT needs is a multiple process (Delzotto, 2022). In addition to the assessment of users' abilities and needs, the assessment of needs for AT should also include the determination of goals, the selection of AT solutions to be used, the procurement of AT, the implementation and adjustment of AT, continuous monitoring of progress and the provision of support for the use of AT in the environment (family, kindergarten and school) (Delzotto, 2022, Pinjatela & Vinceković, 2023).

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CONCLUSION

The non-use and abandonment of assistive devices can have a negative impact on the quality of life of people with disabilities. The studies included show that many factors can influence the non-use of assistive devices. The reasons may lie in three types of characteristics:
(a) characteristics of the user: e.g. physical condition, pain, preference for old assistive devices or use of remaining capacity, increased body weight, difficulty in use, dissatisfaction, discomfort, unmet needs and expectations of the user, deterioration of health or physical condition, preference for human assistance, lack of training, perception of the importance of using these assistive devices by the user, misperception of the assistive devices, the expected/recognised value, lack of motivation for use, progression of disease, fear of technology, lack of access to assistive devices, lack of knowledge about available assistive devices,
(b) characteristics of the assistive devices: e.g. inadequacy/inappropriateness, design of assistive devices and discomfort of use, use of several different assistive devices, insufficiently clear instructions for use, insufficient adaptation),
(c) characteristics of the environment: e.g. lack of training of experts and users, misuse of accessible infrastructure, challenges in the use of assistive devices in social interactions, stigmatisation of users, characteristics of informal carers, challenges of the technological ecosystem and infrastructure, system failures, lack of access to assistive devices, limited access to funding, insufficient presentation in practise.
There is a need to identify which factors influence non-use and refusal to use assistive devices and which types of assistive devices are most frequently not used. Understanding these factors is the first step in reducing the problem. Due to cultural differences and differences in assistive technology services, it is certainly necessary to conduct studies for different countries to establish correlations between common challenges.

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