

INFORMATION TECHNOLOGY AND PEOPLE WITH DISABILITIES

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Abstract

Computers are more important for people with a disability than for common population. This group cannot work or study in obvious way. The reduced ability of movement does not enable to leave their residence, to meet other people or to join in numerous activities.

Due to this reason electronic communication has capital importance for these people. Contemporary market offers computers with modifications, technical equipment and assistive devices. It is necessary to consult their right use with a professional and the best is an occupational therapist. On the base of initial medical history the therapist recommends suitable and safe operation of the computer. Great emphasis must be put on ergonomics of working place, ergonomic aids and work organization. This avoids possible stress and complications. Education is very important. With the help of computers disabled people may not be limited in such extent, both in company sphere and study or career implementation. They can realise themselves, obtain information, advice, assistance, they can make new contacts and enjoy themselves. Electronic communication eliminates isolation of these people.

Not insignificant plus is also financial advantageousness of electronic communication. Computers and internet network can be an important way of education for those people whose regular school attendance causes problems. Thanks to work on a computer the employment opportunities and retraining possibilities appeared for people with a disability. This information is principal and is related to job rehabilitation and motivation for further education. It is very important to obtain information on various projects and to join them. Although the disabled people have legislative protection in the labour market, the interest of the employers and their individual approach is still essential. It is also necessary to impact social environment and the access of our society.

Key words: *people with a disability; information technology; electronic communication*

INTRODUCTION

Rehabilitation can be understood as the task of the whole society in order to help to integrate people who are limited in some operations by their health state. And exactly this positive view is solved by the International Classification of Functioning, Disability

and Health (International Classification of Functioning, Disability and Health – ICF) that does not classify the person but assesses restrictive (disabling) situations in which the person is and tries to solve them (Pfeiffer and Švestková 2001).

Two individuals with the same disease cannot have in fact (according to ICF) various level of their functional abilities.

In other words – the same diagnosis can have different consequences for different people (e.g. with the regard to their current social situation). Classification was developed to improve communication among medical branches, the system of social security, research spheres on social policy and other general professional public (Zeman 2010).

For example, if the client has the upper extremity movement disorder and, therefore he/she cannot operate a computer, this situation is limiting for him/her. But if the computer will be adjusted, such as voice-controlled or otherwise, and he/she will be educated by a professional, preferably by an occupational therapist, he/she is not limited by his health situation in any way.

Occupational therapy is needed for patients whose ability to be independent in activities of daily living was limited after the disease. Occupational therapist tries to achieve maximum patient's self-sufficiency by using various mechanisms, methods and equipment with necessary compensation aids. Training is mostly carried out in a rehabilitation centre in a training apartment. During the training, the occupational therapist uses methods of intensification of the demands to carry out the activity. In evaluation a variety of assessment tests is used.

Personal, basic or basal ADLs (Activities of Daily Living) are understood all daily activities related to basic physical functions, such as personal hygiene, dressing, eating, toileting, transfers etc. ADLs also include doing shopping, housework, the use of public transport, etc. These ADLs are called behavioural and social activities of daily life and they are instrumental or extended ADLs. Instrumental ADLs include functional communication, where just the use of a computer belongs (Krivošíková 2011). The main aim of occupational therapy, for example in tetraplegics, is very important part of the training of functional hand grips. Positioning of tetraplegic's hand to functional hand is performed in several ways, e.g. positioning splints and braces (Wedsche et al. 2009).

Communication is also coded in classification ICF. It belongs to environmental factors, which stands for letter "e". ICF is marked by small letters. The first are the bodily functions – body function, which is marked with letter "b". The second are

bodily structures – body structures, which are marked with letter "s". The third are activities and participation, the most basic components of human behaviour. They are marked with "d" (WHO 2001). For factors of environment – environmental factors is used above mentioned "e". The activity is an operation or an action performed by a human and it represents perspectives of functional abilities of an individual. Participation means an involvement in a life situation and it represents social perspective of functional ability. Activity and participation are presented in the following domains: learning and knowledge applying, general tasks and demands, communication, mobility, self-care, life in a flat, interpersonal interactions and relationships, main life spheres, community, social and civil life. Compensation aids and technical equipment are used everywhere (Mpofu and Oakland 2010).

The attitude of the society towards the disabled has changed. People with disabilities are considered full citizens, who are entitled to a range of services, according to their own consideration. They can fully join the society, participate in political process, maintain the quality of life and be gainfully employed (Smith 2013). However, it is still necessary to influence the social environment to realize positive integration of the disabled among healthy population via wide-society approach and legislative norms. People with disabilities need legislative protection in the labour market as well. Also the Czech Republic as one of the member states of the European Union had to modify in a significant way the legal standards in accordance with the legal doctrine of the European Union (Bedrnová and Nový 2007).

E-mail, Internet

An important means of communication is an email. For lots of handicapped people a computer is the means of their employment. With the help of computers they process and transfer the results of their work. Internet is a communication tool which is able to transmit text, visual and audio information. It helps people at work, at home, it brings information and entertainment. After the use in many branches, Internet has found its way to handicapped citizens and thus it opens up new horizons in getting knowledge, new

job, contacts, friends and self-confidence. It is possible to contact people with similar problems, to seek help, to solve critical life moments or just to chat (Votava et al. 2005). Internet addresses provide sufficient amount of information relating to health issues. Hospitals provide information to the public on the Internet. Thus, the users can acquire most of information about the type of services and the specialists (Zvárová et al. 2002). Thanks to the development and financial availability of communication technologies the possibilities of their use for the disabled spread. Communication technologies serve to work activities, handling personal affairs from their home, e.g. the purchase of the goods via the Internet, electronic banking. For computers it is possible to make change that will facilitate the use of computer to people with various limitations. The whole process is called adaptation (Jelínková 2009).

Shopping via the Internet, electronic banking

These services require good security. For disabled people these services are interesting (there will be no communication problems, saving time and fuel, more personal comfort and independence). They can perform common purchase via the Internet (food, things of everyday use). The control of the bank account without necessary physical presence may again bring to the disabled clients the feeling of more freedom to make decisions about themselves, to solve financial transactions quickly and accurately and not to rely so much on the help of the others. But again it depends on security measures, reliability of banks, the availability and the quality of network connection to acquire more supporters from the ranks of the disabled.

Newsgroups and mailing lists

For people interested in life with a disability it may be interesting to create or attend a conference on the Internet where it is possible to discuss and attend an exchange of information. There are Internet conferences and groups focused on integration of people with disabilities to society, on various aids for them, different types of therapies, etc.

Electronic conferences as conferences of university networks enable real connections of conference participants via website.

People with mobility limitations can actively participate in professional events from their home environment. Electronic conferences have the same course as physically organized conferences. Via an electronic invitation any interested person in a particular topic at the conference can register. The contributions of all participants are included in the database and made available to other participants.

Blogs

Web notes or blogs are applications of wide importance because they include inside form from private diaries to official media news. They bring handicapped people information and ideas which they are interested in. The contributions are imaged in backward chronological order, e.g. the newest are up. One author, group of authors or large community of “bloggers” can contribute to a blog (Walter and Janeček 2007).

Social net

Social nets enable to handicapped people a contact with friends and acquaintances. From their environment and comfort they can easily communicate with others, share various information, photos, videos or plan meetings. Interaction is mainly with people who are added to friends. There are lots of social nets where it is possible to register but in the Czech Republic the Facebook is the most used. Nets differ in some extent, contact with the employers can be eased for the handicapped via LinkedIn (Social nets 2013).

The way of short communication, dialogue of two or more people via social nets is called chat. It offers joining to a certain community or interest group. It happens in real time and in a form which is suitable to the user, by written text or by transfer sound or image that is called audio chat or video chat (Wikipedia 2013).

Skype

If the disabled person has sufficiently fast internet connection, the appropriate operating system and the computer is equipped with a sound card and speakers, it is possible to install software for so-called internet telephony, i.e. Skype. Via Skype users can talk together (voice calls) or with a webcam they can have so-called video call (Walter and Janeček 2007).

Tools for disclosure of information technologies

Technical equipment (assistive technology) and assistive devices enable carrying out ADLs to disabled people. Complex appliances and devices serving primarily to remove barriers in the environment and communication barriers are called technical means. Devices requiring less servicing (low-tech) include modified keyboard and mouse to the computer, modified drivers for typing on the computer. Devices of highly intensive operating, such as voice-activated computer, are called high-tech (Krivošíková 2011). For the use of technical means it is very important to consider the needs of a person with disability, to find out the requirements of the environment and the options of the equipment. The devices should be recommended in case when it is unable to perform activities in different way. Their proper choice and use must support the independence of a person with disability (Dahlin and Soon 2005).

Today in the market, there are numerous assistive devices which allow disabled people to control the computer. Their choice depends on the type and the degree of disability and also on whether the physical limitation is combined with any further limitation. The devices are produced not only in the basic design but they can be adjusted and configured according to individual needs of the user (switches, keyboards, programmes). The advantage is that lots of companies and organizations offer free renting and testing of the equipment, as well as expert advice on the selection of appropriate device. People with serious defects of the musculoskeletal system are provided state contribution to the special aid according to Act No. 329/2011 Coll. on giving benefits to people with disabilities. This contribution can be used, inter alia, for the special components of a personal computer, such as a special mouse, keyboard or software. The contribution is entitled with standard excess 10% of the price. At the price of the aids up to 24,000 CZK the income of the applicant and together with him/her judged people are assessed. An application for contribution is given to the regional office of the Labour Office of the Czech Republic.

The control of a computer can be eased for people with disability and fine motor disability in several ways:

Simple aids for mechanical control of a PC

Basic simple ergonomic aid is individually made rod which is put on the palm (under the little finger) or it is placed in the mouth with the help of which individual keys of a standard or special keyboard are pressed. A similar device can be also purchased in a form of a light construction on the head where the pointing rod is placed under the jaw so it does not obstruct when looking on the screen – Head pointer device (Petit 2013).

Forearm props serve for more comfortable use of the mouse. Forearm and shoulder strain is reduced as the elbow and the forearm are put in a soft pad which is attached to the articulated moveable rod fixed to the table edge. Another aid from this series is a keyboard pad that keeps it tilted in an ergonomic position so it facilitates the user writing (Motorika 2013).

Special keyboard

This group can involve visual keyboards placed on a computer screen which can be easily set in the operating system Windows. The keys can be easily selected with the help of a mouse or other movable device according to user's needs. Instead of physical keyboard the keyboard on the screen for typing texts and putting data can be used. The programme on the screen shows the visual keyboard with all standard keys. The keys can be easily selected with the help of a mouse or other moveable device or only one key or a group of keys can be used and thus select individual keys on the screen. There are various types of keyboards with large keys which have bigger size and resistance than standard keys. They can have reduced number of keys or keys of different colour. For more precise putting of fingers and prevention of unwanted pressing other keys it is good to add a translucent cover of the keyboard. In order to satisfy specific users' needs, various programmable and configured keyboards are offered. Their laying out, function, stress power or

speed of the response are defined by special software. The keyboard can be used both in laying position and sideward. A similar, simplified option is a sensor keyboard with only the most needed keys of big size and clear mark. It can be attached to the PC in parallel with a standard keyboard. Various shaped ergonomic keyboards for both hands or just left hand or right hand enable easier accessibility of the keys without needed movement of arms.

Programme with installed sound of the keyboard which “reads” individual keys after their press is very helpful especially for people with combined defects. The advantage of this programme is freeware.

Alternative computer control

a) With the help of hands

Control of the computer must be safe and ergonomically planned according to the type of disability, from light to serious difficulties and reduced motor skills. The aim of ergonomic workplace and work organization is to prevent stress and muscle tension (Šimčík et al. 2004).

Various alternatives of computer mice are available to clients who just need to modify the conditions of use of common PC mouse. With the device Bigtrack or Kidtrack there is no need to move as a normal mouse, the ball in the middle rotates and press of buttons is applied to click. For another type of disability with impaired fine coordination of movements the device called Orbitrack is preferable as the mouse cursor is controlled with a single light touch without moving the entire hand, arm or wrist. The clients, who do not achieve large-scale movement or want to manipulate the mouse in bed without the solid support, can use Micro Track. The computer can be operated with only one finger of any hand, e.g. Kensington Orbit Optical Trackball mouse or Ring mouse, a wireless mouse in the shape of a ring. From numerous ergonomic mice we can mention for example, Evoluent mouse to work in the natural position of the hand or AirObic mouse which is very suitable for people suffering from weakening muscles. The vertical mouse or joystick mouse are appreciated by people with little skill, arm tremor or spasticity in the hand. For clients who are not able to click on standard mouse buttons are designed adapted mouse buttons brought out to external switches. Separately,

the external switches with definable function are used by clients for whom the alternative mouse computer control is demanding. Under the switch is selected press of a key or button on the mouse. Switches have different sizes and shapes, made of plastic or wood, which can be activated only with a soft touch. Some are made with an adjustable pressing force required for their activation which is useful for various disorders of motor functions. They are connected to the computer via the interface either via a standard USB or wirelessly (Motorika 2013, Petit 2013).

b) With the help of other body parts and body functions

In the market with assistive devices it is possible for the users with severe disability to purchase devices to control the computer by moving the eyes (Tobii system PCEyw Go or 14 Control). These systems replace the standard PC mouse and views can control any application on the computer. Proven aid for people with severe mobility disorder is so called IntegraMouse – PC mouse, the pointer of which is controlled with the minimum lips movement and mouse buttons are replaced with breathing in and out. Due to its small size and wireless capability it is possible to use the mouse IntegraMouse while sitting, lying, the mouse attached to the wheelchair etc. Another positioning device for users who cannot control their computer by using the hands is the SmartNav device. In this case, the natural movement of the head is scanned by infra-red camera, placed on the computer screen. The camera follows a reflex point placed on the cap, forehead or client's glasses and in this way the mouse cursor is controlled. Another device to control the computer without hands is Tracker Pro. The technical development allows other alternative methods of service of computers, external switches controlled by breaths in and out (Sip/Puff Switch), by forehead or face (similar to the switch fabric sponge Pillow Switch) and by the movement of the trunk or shoulder (long shapeable holder FlexAble Switch). For easy access, all types of switches can be attached to the edge of a table, a bed or a wheelchair with convenient holders (Motorika 2013, Petit 2013).

Some users, often after severe injuries, are prevented to communicate by speech because of the seriousness of their disability.

They can only move their head, finger or other part of their body. For them, a special computer programme has been developed. It is controlled with one key which enables these people to speak about their needs in their neighbourhood. With this programme it is possible to type texts with a minimum number of pressing one key by means of virtual keyboard. The keyboard can be combined with an intelligent dictionary offering a group of words which correspond to pressed keyboard sequence. The method of typing text is based on the principle of writing SMS on mobile phones (Petit 2013).

Voice control

Special software to control the PC with voice or sound makes available computer and information technologies for people with very severe disability. In the JetVoice programme, the user without hands activity moves the mouse and presses the keys using previously recorded orders. People with associated difficulties in speech are able in this case to control the PC very simply just by stamping or clapping, so even words are not necessary. Programme called MyVoice controls the computer and inside installed programmes also with the voice. It has a number of other useful functions, such as the possibility to dictate the text letter by letter, words or phrases, to control electronic mail, to control Internet, to fill in the forms on the web, to browse in electronic press, to start up and control programmes for work or entertainment. In this way, with voice it is possible to switch on the television, radio or to dial telephone number and to have a call if a special modem is connected to the computer. Effective complement and extension of MyVoice programme is MyDictate programme designed to dictate the text. It is equipped with an extensive dictionary containing more than half a million Czech words and expressions and other functions increasing user's comfort (Petit 2013).

Aids for other technologies

For people with motor disabilities, the producers try to ease the use of modern technologies, as tablets, MP4 players and mobile phones. First, with several types of stands and assembly systems through which the device is connected to the user's range or

with different drivers. There is a way of control via joystick using built-in switches or external switches are used according to individual user's needs (Petit 2013).

Occupational rehabilitation

Work is one of the basic needs of a human. If a person cannot be engaged in work for a long time, frustration or stress can follow. Occupational rehabilitation makes efforts to return people with disabilities in the original work or to assist them in finding suitable working activities. It is a part of a long-term rehabilitation plan. At the end of this plan there is a statement on working fitness and the degree of disability. For the assessment of further working employment is used occupational therapy (Kolářková and Kodymová 2005). The implementation of occupational rehabilitation is determined by Decree No. 518/2004 Coll., implementing Act No. 435/2004 Coll. on employment, as amended. Occupational rehabilitation is provided by the Employment Office with other agencies including agency of supported employment. The assessment of functional skills of the client when selecting working activity is provided by ergodiagnosics. The term was set up by J. Pfeiffer, who started in 1981 the programme of ergodiagnostic evaluation on the basis of foreign experience. It is used for evaluation of the client in respect of employability and potential. Individual approach requires the work of a team of experts (Šajtarová 2009). Rehabilitation ergonomics deals with solving a job. Depending on the type of disability various types of aids and adaptations are used. Professiogram and ergonomic job analysis is used to assess the working conditions. Functional job description is used for the assessment of people with disabilities. Professiogram is the analysis of the work and the post from a physiological, organizational, technical and sociological point of view. The aids are important and their suitability must be tested and assessed (Gilbertová and Matoušek 2002).

Education and employment of people with disabilities

For lots of disabled people the assistive technologies are still not available in their everyday lives. As Miler (2010) states, the

reasons include the lack of financial sources for the technologies. He also mentions limited access to vendors of assistive devices and to therapists and professionals who would assist in the selection and the use of assistive technologies, especially in case when the disabled live in remote locations. He describes that some people with disabilities report also fear of stigma associated with the use of assistive technology.

In the Czech Republic some of non-profit organizations organize for people with disabilities courses of basic computer skills, courses for building of Web applications, programming courses or training sessions for the network administrator (Paraplegic Centre Paraple 2013). They are often completely free for the participants. The applicant who does not have enough money can even choose the course that needs to apply for a job in any other training company and on the base of a request a contribution is provided. This advantage is offered for example, by Konto Bariéry, as well as the possibility of obtaining, if necessary, the computer (Konto Bariéry 2013).

People with disabilities who want to become IT professionals, network administrators, programmers or graphics can study on selected common vocational secondary schools and universities, in the form of e-learning in the comfort of their own home or in a distant way which does not require frequent physical presence at school. At colleges in the Czech Republic (e.g. ČVUT Praha – Czech Technical University in Prague, VŠE Praha – University of Economics, Prague, Masarykova univerzita Brno – Masaryk University in Brno and others) are created centres for students with special needs, whose staff help the students to remove technical and other obstacles in the study.

In a subsequent job search can help some of the non-profit organizations, agencies of supported employment or locally relevant branch of the Labour Office of the Czech Republic, where it is necessary to register as a job applicant or a job seeker. Within the Employment Act it is possible to use some contributions to support the employment of people with disabilities. On the website of the Ministry of Labour and Social Affairs is published the catalogue of organizations employing more than 50% of disabled people (Catalogue... 2013). There are lots of web links

to companies, assisting in labour inclusion of people with disabilities. On these websites it is possible to insert the CV and a motivation letter, to look through and react to job offers, use the counselling, ask for personal assistance etc. Occupation assuming both user and professional skills of work with IT are advertised by specialized labour exchange and portals with employment opportunities for disabled people.

The practice of disclosure of information technologies in the Rehabilitation Institute in Kladruby

Spinal cord injury is a complex stressor that brings tremendous changes in human life. People with this injury have to cope with the situation, to cope with new, unknown situation, which all means high level of stress for a human (Kennedy 2009).

Injuries, diseases and conditions after surgeries of musculoskeletal and nervous systems are an indication for treatment in the Rehabilitation Institute Kladruby. These include also spinal cord injury. The priority of medical-rehabilitation care is improvement of clients' health state and the restoration of their independence and working skills for a successful return to home environment and to common way of life.

It is obvious that for people with disabilities the use of information technologies plays more important role than for common population which can work and study in a usual way. If we enable to use computers to disabled people, we significantly ease their integration into society. That is why the teaching of computers service is taken for granted part of occupational therapy in Rehabilitation Institute Kladruby and therefore it is put into individual rehabilitation plan for those clients who need it. Occupational therapists focus on two targets in this area. First aim is to introduce the basic functions of a computer, especially electronic mail, the Internet, as well as the use of the Skype. Patients can use these skills to obtain the necessary information, for communication, individual study or future employment.

It is also necessary to practise self-sufficiency in mechanical handling with the computer with patients who have motor disorders; to train, for example, the ability to switch on the notebook or to type text self-

reliantly. If it is necessary, the occupational therapist together with the patient seek various adaptations how to control the computer and they try alternative aids which can ease the use of a computer.

The patients of Rehabilitation Institute Kladruby attend a computer lab where they have the opportunity to improve their computer literacy under the guidance of an experienced therapist.

There are solid computer configurations with commonly used software and the Internet in the lab. Occupational therapists lend notebooks and help to install them directly on the bed to people who are treated for spinal cord injuries and have problems with sitting on a chair or a wheelchair. These severely handicapped people have usually problem to control the computer in a normal way. The pointing device IntegraMouse is tested in Rehabilitation Institute Kladruby with the assistance of the staff. They teach to operate the PC with the mouth movement or to use SmartNav4 or 14 to alternative control of the PC with the head or eyes movement. In the workroom of the speech therapy the patients have available software MyVoice – they work on the computer only with the use of their voice using a special microphone.

The patients of Rehabilitation Institute Kladruby are offered other mobility aids when they have physical disabilities that make it possible to use the upper limbs in some extent. During cognitive trainings of patients after cranial trauma, where it is necessary to control special software, some patients use very simplified cursor keyboard where only necessary keys are located. People with less impaired fine motor skills or orientation are offered clear keyboard with a reduced number of large keys in both colour and black and white version and variously adapted computer mouses for easier control of cursor. From them, it is possible to try for example, ergonomic and very durable device Orbitrack in the shape of rectangular box marked with a coloured circle. Depending on which position of the circle the finger is placed, the mouse cursor moves in this direction. It can be used both by right-hander and left-hander. The device Bigtrack is also convenient for patients with motor difficulties, especially for those who have problems to move and click the standard mouse. Bigtrack is of a

larger embodiment, the only movement is with a ball placed in a static basis. Another available option is a mouse in a ring-shape (Ring Mouse). It does not need the underlying surface as the device is just put on some of the fingers and is controlled by moving the thumb on the touchpad. Ring Mouse works without a cable, at a distance of several meters.

In Kladruby are also touch LCD monitors to relieve clients the work on the computer or the training within psychology and speech therapy. These monitors will ease the communication of the device with untrained user or person after brain damage. Direct touch of the cursor on the screen accelerates the understanding of the situation more than in the control of the cursor with a computer mouse.

Practical aid that provides access to the computer to disabled people without experience in computer operating, to seniors and users with a combination of visual impairment is the software Dolphin Guide. The trained occupational therapist helps with the operation of assistant programme to interested people in Rehabilitation Institute in Kladruby. Software is very simplified, so even older or disabled person with no previous computer skills can learn a new skill – to look for information on the Internet, to type texts, to call or communicate via email which means a major shift in the integration in the company.

The aim of rehabilitation care in Kladruby is to achieve the greatest possible independence of the patients and their maximum possible involvement in society and working life. Some patients after an injury or surgery have to think about another job as their health state does not allow perform the current job. The earlier the client starts to think about this change and continuance of working activity at all, the greater chance to succeed. Because of this reason, the Rehabilitation Institute Kladruby started in 2010 to cooperate with a company Chance for education – public benefit corporation on a project called “The support of clients of Rehabilitation Institute Kladruby in future social rehabilitation”. The project activities should lead the clients during hospitalization to acceptable way of preparedness to their job. The forms of project support were various – counselling, participation in seminars,

courses and retraining, help in looking for a job. Nowadays, the project continues only in a form of realization of social seminars where patients among others get acknowledge about circumstances of the employment of people with disabilities in the Czech Republic.

As to improvement of clients' computer literacy which is in today's job market the most mentioned requirement, by the end of 2012, 22 two-day courses of basic PC skills (MS Word, Excel, Powerpoint) in total were held. The courses were attended by 105 people. 20 people attended 6 advanced computer courses via application Live Meeting. There was one individual course of basic PC skills for a seriously disabled patient directly in the bed with the use of the Integra Mouse device for alternative operating a computer.

CONCLUSION

In disabled people the ability to use information technologies is an important link with the society and the way to needed information. The quantity and the quality of assistive devices and technical resources are important. People who are able to operate the computer not only on the user's level but also on professional level greatly increase their chance for having a job, as at the current labour market is still lack of qualified workers in IT branches. Therefore it is worth thinking of the improvement of IT qualification.

It is very important for the disabled people to meet information technologies, adjusted tools, the possibilities of employment and retraining in the rehabilitation centres offering coordinated rehabilitation. It facilitates their return to original environment.

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