NEWRON – Therapeutic Software for Free usage

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Abstract

NEWRON application is a therapeutic software tool which focuses on supporting the development of persons suffering from various psycho-social disorders. The application consists of a set of games which can continually influence the social perception and social interactions of the target persons, it helps to activate their cognitive, psychomotor or decision-making functions and can optimize the usage of modern information technologies and electronic games to promote their personal development. In the first period the target group consists of children and teenagers with autistic spectrum disorders, subsequently will focus on people who suffer from other psychosocial and cognitive troubles and disorders. The application is the result of a close cooperation between the Department of Psychology at the Faculty of Arts and the Human-Computer Interaction Laboratory at the Faculty of Informatics, both from the Masaryk University.

The article presents a preliminary study of this open-source project and description of the therapeutic software NEWRON.

Keywords:

Therapy, computer-based-intervention, autistic spectrum disorder, ADHD, human-computer interaction, play-therapy

Introduction

The possibilities of electronic media are on the increase... and, with the right approach, also the possibilities of using modern technologies in the process of therapy are rising.

The following article consists of a short description of the use of therapeutic software NEWRON in the context of the so called autistic spectrum disorder.

The software has been primarily created for this type of users; however, its target group is much wider (see below), and the future is open.

Introduction to the topic

Specialized services aimed at the support and development of people with diagnosed autistic spectrum disorder (ASD) have been in the Czech Republic still stabilizing, developing and forming themselves. In their intensity they are far from the range of services and possibilities of the more developed countries in the world.

There exist a large number of international studies, intervention programmes and supporting activities that evidence the positive influence of information technologies on the development of children and adolescents diagnosed with ASD. There also exist theories connecting the intensity of ASD with the development and the quality of cognitive/executive functions – theories based on the principles of education and neuropsychology (the so called mirror neurons).

Particularly children and adolescents that are diagnosed with the so called functional ASD (i.e. Asperger syndrome) react to information technologies very well, and they can use them for their needs and everyday activities.

The reaction to IT impulses/information is often more positive than the reaction to living objects.

The combination of the "living object" and information technologies can not only make it easier for children and adults with ASD to become part of everyday life (in a school, work or social context), but also increase the quality of their lives in general (the so called well-being).

Description of the therapeutic software NEWRON

— The use of modern technologies offers a lot of possibilities, but it also has clearly defined limits.
— The basic limit for a therapeutic tool must be its free (or professionally supported) usability with maximal minimization of the risk of an addiction to this tool.
— The therapeutic software which is being developed at two departments of Masaryk University, is primarily based on the "classic games" (from the 1980s and 90s).
— The core of these "classic games" is usually the strengthening of specific skills or abilities of the user (cognitive, executive or decision functions; attention, memory, psychomotorics etc.).
— The basis of these "classic games" is neither a perfect (real-life) graphics nor an "engaging story" that would draw the user to the action and force him/her to play again and again.
— The game NEWRON is only created in a basic graphic environment (neuron, brain and human organism) with a basic guide (Newron, see Picture 1) who in an easy interactive way reacts to the specific action of the user (for example, in the form of gestures, written or iconographic communication).
— Some games depend on the presence of other persons (a parent, sibling, classmate, therapeutist), such as Guided Social Interactions (see Picture 2), based on Kinect device utilization.

— Most of the games (modules) is thematically based on the "classic games": pelmanism system (Picture 3), attention with the choice of the central picture (Pictures 4), a maze, The tower of Hanoi/London, and many others.
— The software is, and will be, freely downloaded from the source pages www.newron.cz (specifically in the section 'Download' as an open-source project).

The principles

The software NEURON is based on three basic principles:

— Optimalization of the use of IT for personal/social development (cognitive, executive and decision functions; ability to distinguish emotions, experiencing; identification/perception of needs – mine and of the others; self-development – acquiring knowledge, development of abilities and skills).
— Activation of motoric functions that are connected to the development of all neural abilities of human brain (attention, sensorics/sensitiveness, will, social skills etc.), and that are in general the activating part of human life (children with ASD are not much physically active, and are difficult to be motivated for that).
— Strengthening of social recognition and social interaction in safer conditions for people with ASD (meaning mediated through a "screen").

The first point is primarily connected to the already generally accepted principle of neuroplasticity (and in the applied form to the principles of general neurorehabilitation, cognitive training and other specific neuropsychological methods or intervention programmes). Therefore, the software contains games (task situations) that provoke the development of neuropsychological functions (memory, attention, will etc.). Inspiration for these games was found, for example, in the methodology of CEREBRUM – Brain Injured and Families (www.cerebrum2007.cz), software Happy Neuron (www.happy-neuron.com), Lumosity (www.lumosity.com), or CogniFit (www.cognifit.com), and the method of NEUROP-III (www.neurop.de). There are many impulses for further development of the software (even among the freely accessible games on the internet).

The second and the third of the principles mentioned above are primarily based on the activation possibilities of the device that use IT but also require physical/motoric activation of the user (MS Kinect, LeapMotion and others).

These technologies also enable more playing subjects to engage in the game (for example, parents, siblings, classmates, teachers etc.), and with this they indirectly enable social interaction of individual players (the estimate of abilities/skills of the opponent; the necessity to engage another person for the game to go on; the necessity to communicate their needs and ideas about the further course of the game etc.).

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Possible use

The basis of the therapy (and with that also the therapeutic use of the software) is the continuous development and maximal adaptability in connection to specific needs of the target receiver/user of the software. Therefore, the software is from the very beginning created in a way it could continually update and individualize itself – in connection to the scientific research and the needs of the end users.

The software is created as a part of the activities of a public university (Masaryk University), and so as an open-access – the access to all parts of the software will remain completely free (free of charge).

Current situation

At this moment a basis is available, on which we start building other modules, segments, games, applications etc.

On the development of the software there are involved both professional workers and students at the Masaryk University (Faculty of Arts, Faculty of Informatics), due to this fact it is possible to maintain a truly operational background and supportive/functional environment (connection to the MA or BA projects, connection to research or development projects, involvement of foreign partner institutions, presentations at specialized symposiums or conferences etc.).

The software is based on communication that is not bound by any specific world language – thanks to this also "playing", and passing of experience in particular, will be possible completely freely, internationally.

Aims

Our aim is to create a freely accessible tool that will support natural skills of handicapped people, will increase / stabilize the quality of their lives (well-being), and will possibly enable them to more easily integrate into society.

It is primarily aimed at people diagnosed with ASD; however, also other specific applications for people with other diagnoses will be programmed on the basis of NEWRON – such as, attention deficit hyperactivity disorder (ADHD), behaviour disorder, and disorder of social adaptation, special learning disorders, post-traumatic and demented states (neurorehabilitation) etc.

The secondary aim is to strengthen the general awareness of the possibilities of an effective use of information technologies (in both everyday life and special intervention situations) with general and professional public; the aim is also to support the awareness (of the general public in particular) of professional associations or activities (education systems, intervention programmes, self-help groups etc.) in the context of individual "diagnoses" (for example with the use of specialized symposia /www.symposium.info/, presentations or articles in popularizing sources of the Masaryk University /veda.muni.cz, www.psychologon.cz/, or public media /Česká televize, Český rozhlas/).

Vision

If we manage to build well the technological basis of the software NEWRON, we will aim in the following years at a similar support of other people with (primary or secondary) psychical disorders, such as:

— post-traumatic and post-operative states (neurorehabilitation)
— disorders of social adaptation (behavior disorders, hyperactivity, impulsiveness/aggressiveness)
— disorders of cognitive and executional functions (ADHD/ADD)
— self-harm
— special learning disorders

History

The idea about a creation of a therapeutic computer game began in the second half of the 1990s when Pavel Humpolíček (then a student of the Department of Psychology FF MU who was dealing with the game therapy and diagnosis, such as the use of the Scenotest) addressed to big Czech PC game companies with the offer of cooperation on a game aimed at such a way (diagnostic-therapeutic; primarily aimed at behaviour disorders).

However, the companies were not interested in such a game, because of that the idea went through the standard game-therapeutic way, and later it aimed towards the tools usable for neurorehabilitation.

At the end of 2012, fortunatelly, there came an offer from the Rectorate of Masaryk university for a project "Search for Partners for Interdisciplinary Projects" with the use of the Information system MU – after placing the application, a group of several other like-minded professionals (from pedagogy, sports or informatics) created itself.

Simultaneously with the creation of the "enthusiasts", the beginning of the project was also supported by sponsor means from Microsoft company (Ing. Irena Brifordová) which enabled the purchase of usable technologies (MS Kinect, Xbox 360 including games, or Leap Motion).

Only two departments survived the first enthusiasm – the Department of Psychology FF MU (Pavel Humpolíček) and the HCI Laboratory FI MU (Barbora Kozlíková) – that at the end of 2013 defined the basic features of the therapeutic software.

Since January 2014, the software has been intensivelly developed (by both students and academic workers) at the Faculty of Informatics MU (under a professional supervision of Dr. Barbora Kozlíková and Dr. Jiří Chmelík); since september 2014 the software has been put to practice – in the families with children diagnosed with the so called functional form of ASD who are studying the Faculty of Arts MU (under professional supervision of Dr. Humpolíček).

Currently, two other profession institutions are involved in the practical aspects of project NEWRON: APLA South Moravia and the primary school at Štolcova street (Brno).

NEWRON is and official software of the Masaryk University, and since September 2014, it has been sponsored by a newly founded Endowment Fund KOMETA.

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Current Possibilities of Cooperation

... are announced at this web site: http://www.newron.cz/o-projektu/aktualni-situace
In case you are interested to become a part of the project, use an email address info@
newron.cz, or other information published here: www.newron.cz/kontakt.
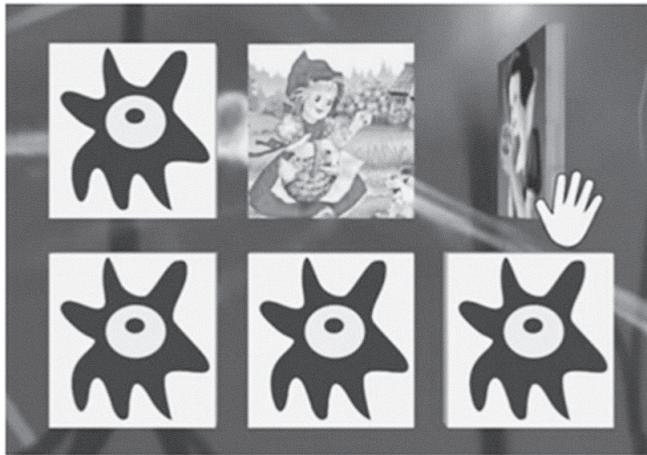
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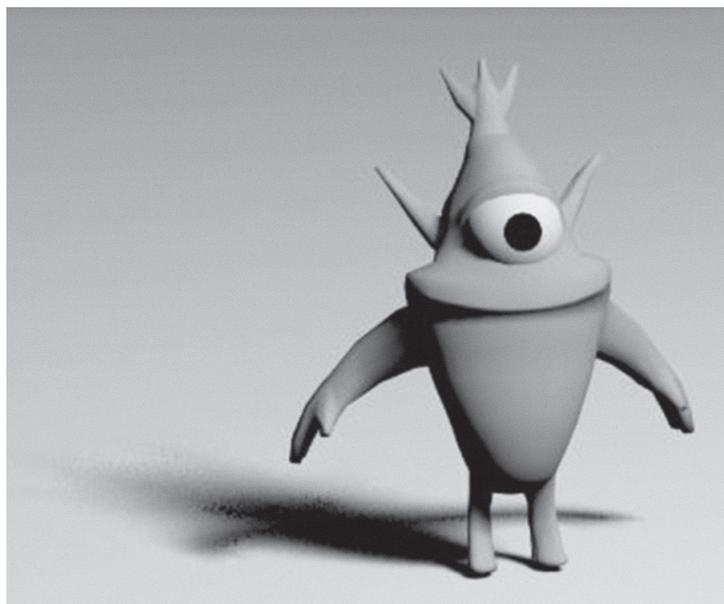
Picture 1: Newron guide

Picture 2: Social Activation Module (based on Kinect device utilization)

Picture 3: Pelmanism system games

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Picture 4: Module based on activation of attention with the choice of the central picture