DIGITAL TECHNOLOGIES TO HELP PEOPLE WITH AUTISM: HOW TO INCREASE EVERYDAY COMFORT

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Abstract

We propose a 3-embedded level method to analyse and improve the daily life of disabled people who want to live in partial autonomy. Our method consists, of a transversal and multidisciplinary approach to first evaluate the pathology (physical or cognitive) of the user to derive a reminder process that can assist efficiency in daily tasks. If necessary, a second level can be driven to adapt the housing environment of the user in terms of sensibility and psychological aspects for example through colours of the indoor environment, ambiances and atmospheres, or through snoezelen-based systems. At a higher level, heavy modifications can also be done involving for example home automation and ICT systems with an Ambient Assisted Living philosophy.

Keywords: comfort; autonomy; autism; digital technologies

Introduction

Comfort is a necessary criterion for well-being at home. Nowadays technology and smart homes can promote this comfort and improve the daily life of their users. We focus here on a new approach dedicated to improve and enhance comfort of people with autism who aspire to partial autonomy.

Autism is a pervasive developmental disorder characterised by an alteration of social interactions, communication and behaviour. Difficulty in recognising social codes and emotional hypersensitivities are recurrent characteristics. There is a growing number of people with autism with an increase of about 16% noted since 2014. In France, 650,000 people require special attention in particular with regard to the cost involved by autism they have to support. It is therefore necessary to find a solution. It is therefore necessary to find a solution.

Classically, rearranging the housing environment for a disabled person requires rethinking the building parameters to ensure comfort and security. This is for example the case for the elderly who want to stay at home and need to live in a safe housing environment in terms of mobility, comfort and security for daily activities. Adaptation of the interior of buildings and installation of ICT and home automation systems can assist in achieving this.

For people with autism (and this is also generally true for people with cognitive problems), these kind of modifications can also be prescribed but are usually not the first layer of the solution to be considered. People with autism are first impacted at a psychological level and not at the physical level. Mobility of autistic people is thus not always impacted so that major structural changes of the building can, in most cases be avoided.

Our 3-level method shown in figure 1 is based upon a 3-embeedeed layer scheme. The first level is driven by a sociological approach, which is vital to evaluate the pathology as well as to determine the needs and daily life parameters of this type of user.

Figure 1. Scheme of the 3-embedded layer methodology.
At the second level, a design approach allows redefining and adaptation of the housing environment in agreement with the psychological needs, sensitivity and tastes of the user. At the last level, a technological approach allows integration of new technologies (Ambient Assisted Living “AAL” support, home automation, etc.) and even prescription of important modifications of the house or apartment (mobility parameters, doors, windows, secured paths, intrusion systems, etc.).

Details the three stages with their different steps that can be proposed to the patients are shown in Figure 2.

![Diagram](image)

**Figure 2.** Scheme of the 3-level approach for autistic person

The first level of our method consists of a study of the user to determine how the person lives in their dwelling and the tastes and preferences of the user, in order to better adapt the environment. As previously explained, autistic people need benchmarks. Thus, to recall the different daily tasks, we plan to provide an application that could be hosted on a smartphone, tablet and smartwatch. One example of this is the application called "Pictotask". It is possible to condense all of a person’s needs during the day, such as going to the toilets or eating. The creation of the tasks is done via a smartphone; a synchronisation process with the watch enables duplication of the reminder on a wearable device. An alert is triggered for the user to perform the task at the scheduled time. Each task the user has to do is described into several steps so that the user can perform the task in full autonomy.

The environment in which we live accounts for 80% of the efficiency of the actions we do. In the case of people with autism, the environment is a major factor in achieving some of their activities, particularly in terms of psychology and sensibility. The second level implies small modifications of the housing environment to best meet the real needs of the user and that favours its autonomy. After a study of the existing environment, the habitat of the person will be rethought in terms of colours, contrasts, design and textures; some rearrangements will be made, in order to create a safe and relaxing environment. This level is mainly based upon Snoezelen concepts to emphasise as much as possible the impact on the user’s feelings.

Level 3 of our method involves the integration of home automation and ICT in the habitat. Today, the applications of home automation (and more generally AAL and smart homes) make it possible to compensate for a wide spectrum of loss of autonomy. Thus, level 3 is not directly dedicated to autistic person but can also be applied to other pathologies or disabilities such as trisomy or mobility/ageing problems. In our approach, home automation is provided to control lighting, rolling shutters and will also control the inputs / outputs of the habitat.

People affected by autism have moments in their day when they feel very stressed. They often express their stress through cries or destructive behaviours. They can also just curl up on themselves and cease to interact with people around them. Through ICT environmental sensors and devices and with an AAL approach, daily activity is analysed to track the user’s mood. The system will adapt the environment and housing conditions to best suit the user’s feelings, to prevent more serious situations developing, and to assist him when needed. For example, if anger or violent attitude is detected, the lights can be reduced, and the shutters lowered to create a soothing and relaxing atmosphere. Once this adaptation is made, the system will continue to capture the parameters so that the environment returns to its original position after a normal situation has been validated.

**Conclusions**

In this paper, we propose to increase the comfort and autonomy of people with autism. Our proposed 3-step method to improve living conditions of people with
troubles or disabilities is focused here for people affected by autism. The three levels are embedded from level 1 to level 3, so that level 3 cannot be relevant if level 2 (and thus level 1) have not been first implemented. As we have shown, levels 1 and 2 are specific to the relative pathology. Even if each pathology has its own parameters, levels 1 and 2 can be redefined to fit the specifications of other pathologies. Level 3 is more dedicated to heavy modifications of the building and is more standard for all the pathologies and disabilities our approach can focus on. To put the method in action, a wide spectrum of competencies are needed, from psychologists to architects and electricians/home automation installers.

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Conflict of interest. The author declares no conflict of interest.

References

1. PictoTask, easily plan your picto-sequences!