The Mind Inclusion APP: assistive technology to foster the inclusion of persons with intellectual disabilities in their community

L'APP Mind Inclusion: la tecnologia assistiva per promuovere l'inclusione sociale delle persone con disabilità intelletive nella loro comunità

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Information and Communication Technologies have been widely used to enhance evidence-based interventions in the education and training of individuals with intellectual disabilities. The use of Information and Communication Technologies for these purposes is called Assistive Technology. Assistive technology is able to support persons with intellectual disabilities to live fuller and richer lives in their communities, supporting more successful functioning across multiple domains: independent living and inclusion in community.
This study has the aim to present and explain the development of an assistive technology tool for persons with intellectual disabilities, the Mind Inclusion APP which can allow persons with intellectual disabilities to search and reach for a location or an activity in their community. The APP was co-created through the support of a participatory design and a person centred approach. A sample of 48 people, including persons with disabilities, caregivers, educators and business owners, was involved at all stages of the project.
This study has shown that persons with disabilities can interact better, be part of their society more easily, and learn new skills reducing the impact of disability on daily functioning by using the Mind Inclusion APP.

abstract

Key-words: assistive technology, social inclusion, cognitive accessibility, co-creation process, person with intellectual disabilities.

Esiti di ricerca e riflessione sulle pratiche

(A.ricerca qualitativa e quantitativa; B. progetti e buone pratiche; C. strumenti e metodologie)

1. Introduction

According to the 5th Edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V), intellectual disabilities (IDs) affect 1% of the overall population. IDs consist of a set of neurodevelopmental disorders that lead to deficits in cognitive areas such as memorisation and organisation, and in social areas such as social skills, autonomy, and independent living (Torrado, 2020). Autonomy and independent living are two of the main goals for persons with intellectual disabilities, and they are strongly correlated to the concept of accessibility, both physical and cognitive. Article 9 of the Convention of Rights of Persons with Disabilities promotes and supports the improvement of accessibility for persons with intellectual disabilities through the "design, development, production and distribution of technologies and systems" (Torrado, 2020).

In this light, literature has claimed that in recent years Information and Communication Technologies (ICTs) have been widely used to enhance evidence-based interventions in the education and training of individuals with intellectual disabilities (Nijs, 2019; Torrado, 2020). A corpus of research studies has reported the efficacy of ICT-based interventions in varied contexts such as special education schools and laboratory environments (Torrado, 2020). The use of ICTs for these purposes is called Assistive Technology (AT) by researchers, as Pinard and Scherer, and literature provides many examples of assistive technology. Assistive technology is defined as any product (including devices, equipment, instruments, software) whose primary purpose is to maintain or improve individuals' functioning and independence and thereby promote well-being and quality of life (Boot, 2017). Appropriate provision of AT, in fact, can enable people to exercise their own human rights and fundamental freedoms to meet personal health and well-being needs, enabling participation in civil society (Desmond, 2018). This concept was also argued during the United Nations Convention that recognized assistive technology as a human right (Lancioni, 2018). In addition, the World Health Organization launched a program to promote Global Cooperation on Assistive Technology (GATE), defining AT as assistive products to maintain or improve functioning and promote well-being, and underlining that persons with intellectual disabilities are a specific group that can benefit from user appropriate AT (O'neill, 2019).

As regards the evolution of assistive technology, it is interesting to evaluate as AT was usually identified with medicalised terms such as "medical equipment" or "invalid aid" or "rehabilitation appliance", underlining more the illness and the loss than the benefit (Desmond, 2018). The contemporary AT classification, instead, takes a universalizing approach to the diverse nature of all humans. An assistive product is then an interface between the person and the life that they would like to lead (Desmond, 2018), contributing to the deinstitutionalization of care (Owuor, 2018). Although AT can not substitute direct service provision, it can play an important adjunct role at improving individuals' capabilities (O'neill, 2019). For this reason, social innovation and technology are becoming novel solutions to social problems being sometimes more effective, efficient, and sustainable than existing solutions, aiming at solving some of the problems that a particular part of society experiences in daily life (Torrado, 2020). Specifically, assistive technology is able to support persons with intellectual disabilities to live fuller and richer lives in their communities, supporting more successful functioning across multiple domains: independent living and inclusion in community. Consequently, assistive technology can be employed as a

support that improves the ability of a person and reduces the gap between what an individual can do and what the individual wants to do (Wehmeyer, 2020). AT mediates the relationship between the person's performance and the requests of the environment, improving functional capabilities of individuals with disabilities. This permits the enhancing of several aspects such as self-efficacy, self-determination, well-being and quality of life (Brandt, 2020; Wehmeyer, 2020). Specifically, AT can improve quality of life including the extent of inclusion of persons with disabilities and their participation in society (Boot, 2017). Furthermore, AT enables persons with intellectual disabilities to gain more opportunity to express their opinions, interests, preferences and to successfully move around their community and in different environments, from religious places to places for recreational and leisure activities (Wehmeyer, 2020). For this reason, assistive technology enhances the ability to participate and feel integrated into a society that becomes more inclusive.

Consequently, AT permits to obtain behavioural and social benefits and to reduce the negative impact of disabilities on daily life and activities. Research demonstrated that a wide range of individuals with different disabilities, needs and care goals, could benefit from the use of technology-aided programs (Lancioni, 2018). Currently, one billion people need them and more than two billion people around the world are expected to need at least one assistive product by 2030 (Lancioni, 2018; Nijs, 2019). Moreover, a first step towards using AT fully is to better understand the experiences of those that have engaged with it. End-users involvement is recognized as being crucial in the development of AT (O'neill, 2019).

In this sense, this study has the aim to present and explain the development of an assistive technology tool for persons with intellectual disabilities, the Mind Inclusion APP, that was designed through a participatory research action. The Mind Inclusion APP, in fact, was co-created through the support of a participatory design and a person centred approach. Concretely, a sample of persons with disabilities was involved at all stages of the project, together with other relevant stakeholders such as caregivers, educators and business owners, in order to understand their personal experience and perspectives, further supporting their accessibility, and optimizing resources and outcomes. The result is an APP that aims at facilitating access to public places in the communities, according to accessibility parameters and interests of the users, providing new opportunities to social and leisure activities. At the same time, the approach to spread the APP consists in a process that aims to generate awareness in communities. The engagement of owners of public spaces, indeed, helps to continue the discussion of the importance and the requirements for making places more accessible to persons with intellectual disabilities, and of the concept of social inclusion.

2. Methodology

The Mind Inclusion APP was developed considering several theoretical foundations and participatory methodologies. First, the main pillar of Mind Inclusion APP is the social concept of disability in which disability is a social construct framed in a specific culture and, consequently, it is caused by the process of interaction of the person with their environment. Social inclusion is strongly related to the concepts of environment and community involvement. Under this approach, the domains of community presence and community participation are relevant since they include

opportunities for social integration (Simplican, 2015). In addition, the development of the Mind Inclusion APP was rooted in the Ecological theory and the Capability approach aiming to enhance the opportunities of persons with intellectual disabilities to be involved in their communities and societies. The capabilities of a person are meant as freedom, independent living and self-determination (Biggeri, 2010).

Secondly, the development of the Mind Inclusion APP considered a participatory approach, focusing on helping participants to work together providing a solution to a common problem. The idea behind that was to consider users' real needs in order to develop an APP that can match those needs and that is technically adapted to them. Nowadays, participatory methodologies such as co-creation methods are regarded as an unquestionable strategy to deliver innovations designed with and by the people.

To implement a strong participatory approach and co-creation methodologies, the development of the APP paid special attention to the combination of the Design Thinking method and the Agile approach. While Design Thinking allows identifying unmet needs of end-users, the Agile approach enables delivering a partially functional prototype to collect feedback, validate our assumptions and readjust. In particular, the following methodologies were used in the development of the Mind Inclusion APP: (i) Design Thinking (DT) that is a 5-steps method focused on discovering meaningful ideas to solve real problems for a particular group of people. (ii) Mindful Design Framework that helps to focus on participants' values and life contexts. (iii) The Agile Method which was used to maintain continued feedback and communication with participants, reflecting their desires. In particular, the Design Thinking (DT) method and the Mindful Design Framework were used during the needs identification stage and The Agile Method was used during the APP production process.

2.1 Sample and selection criteria

One pillar of the development of the Mind Inclusion APP relies on the group of users participating in its development. Four groups of people have been organised in three different countries (two in Spain, one in Italy and one in Lithuania) with the aim of developing the Mind Inclusion APP. They were volunteers, the groups included people with disabilities, caregivers, relatives and business owners of places that belong to a specific community and are focused on fostering inclusiveness in their community. In particular, the total sample was made of 48 people in the three countries with the following profile: 20 people with intellectual disabilities; 8 relatives/informal caregivers; 12 social workers/educators; 8 owner of places (restaurants, bars, etc.)

People belonging to the sample participated in both the needs identification stage and the APP production process. They were selected according to the following selection criteria:

– People with intellectual disabilities. Selection criteria: more than 18 years old, able to communicate/express preferences, motivated in participating, with a supportive context. In Spain, users were persons with intellectual disabilities and people with dementia. In Italy, users were mostly persons with intellectual disabilities and in Lithuania users were persons with autistic spectrum disorder;

- Relatives/caregivers. Selection criteria: people who know how to support users, interested in the topic, supporting the autonomy of people with intellectual disabilities;
- Facilitators/Educators. Selection criteria: working in a service with persons with intellectual disabilities, people who had experience with disability;
- Business owners. Selection criteria: people with sensitivity towards the importance of social inclusion and intellectual disabilities.

2.2 Procedure

As mentioned before, the Mind Inclusion APP co-creation process is embedded into the Design Thinking approach and the Agile method. The development of the Mind Inclusion APP was carried out under four co-creation cycles as the following table 1 shows. Cycles one and two focused on the potential identification of users' needs and solutions while cycle three and four focused on testing the prototypes of the APP with people with disabilities, educators and business owners. After each cycle there was an analysis of the information gathered which was the input to prepare the next cycles.

Stage	Co-creation cycle	Goal	Tools
NEEDS AND POTENTIAL SOLUTIONS IDENTIFICATION	Co-creation cycle 1 UNDERSTANDING (initial approach and collection of aspects related to the problem) DEFINE (collect more common situations shared for "personas")	Familiarize with individual interests and barriers found in the near context (likes, dislikes, situations and places, feelings, barriers, strategies), that help to create "personas"	Mind inclusion game-board Mind inclusion diary
	Co-creation cycle 2 IDEATE (establish an empathy map and define use scenarios)	Explore real situations by being in oneself and in others shoes Look at the problem and share potential solutions among all participants	Empathy map adapted Exploration activity
TESTING THE PROTOTYPES OF THE APP	Co-creation cycle 3 PROTOTYPING	Experimentation. What do participants think about the first representation of the interface? Define strategies for the implementation of the proposed solution	First prototype of the APP Medium fidelity mockup of the APP
	Co-creation cycle 4 PROTOTYPING AND TESTING	Experimentation. What do participants think about the representation of the interface, content and functionality represented? Define strategies for the implementation of the proposed solution	Second prototype of the APP High fidelity mockup

Table 1: The Mind Inclusion APP co-creation procedure and tools

In addition, the World Wide Web Consortium (W3C) guidelines, the "Easy to read" standards and some accessibility guidelines for web content were considered to facilitate the use of the Mind Inclusion APP by persons with intellectual disabilities, with the aim to make it cognitively accessible (FEAPS, 2014; Inclusion Europe, 2009).

3. Results

The Mind Inclusion APP is the result of a co-creation process carried out in three countries (Italy, Lithuania and Spain), in which a network of local action groups, including persons with intellectual disabilities, was involved during both the co-design and co-production stage.

The main purpose of the Mind Inclusion application is to allow persons with intellectual disabilities to search for a location or an activity in their community that can meet their needs and interests. The main users of the application are: a) persons with intellectual disabilities (IDP), including people who can help IDP to use the app, such as their families, educators and friends; and b) Business Users (BU) or the managers of those locations or activities.

In particular, the Mind Inclusion APP has been designed to have the following uses and functionalities (Table 2):

– *Search for a location or activity*: As mentioned before, the main use of this application is to search for a location or an activity according to accessible features and desires. Locations are considered to be public places in a community while the activities are events and festivities that can be held in that community. Locations and activities, represented in the app through simple labels and pictograms, are divided into several categories to facilitate their research as it is shown in the following table:

Locations	Activities
Bar	Cultural activities
Restaurant	Listening to music
Public square	Sport activities
Garden	Shopping
Public services	Drinking and eating out
Library	Taking a stroll
Cinema	Public services
Gym	Others
Health care centre	
Shopping Mall	
School	
Museum	
Supermarket	
Theatre	
Hotels	
Bank	

Table 2: Locations and activities

Since each person with intellectual disability might have different needs, the APP permits IDP to search for a location or an activity according to some filters. After selecting a location or a place, IDP have to answer three questions that help them filter what they need or prefer (Table 3):

Filters	Question	Options
Accessibility	Do you need any facilitation?	Accessible bathrooms Ramps for access
Tranquillity in a place	Do you prefer quiet places or lively places?	Quiet / lively place
Staff	Do you need staff that is used to attending people with intellectual disabilities?	Yes/ No

Table 3: Search filters

– *Reviews*

Registered users can give their opinion about the locations and activities that they have visited or done. There are two types of reviews: a) a short and b) a long review.

- The short review consists of the evaluation of three aspects of a place or an activity: Accessibility, Place and Staff. Each dimension can be evaluated by using a scale from 1 to 5 in which each number corresponds to an emoticon face with a color and a label. The labels and the respectively colors are:1-Terrible – red; 2- Bad – orange; 3-Okay – yellow; 4-Good – light green; 5-Great – green;
- Long reviews permit users to fill in the short review and to write down a comment.

– *Gamification*

The Mind Inclusion APP has also gamification features to engage users. Gaining points by using the app is one of the gamification characteristics. Users can gain points when they write a review. For every short review, users gain 5 points, for every long review they gain 10. Gained points will allow users to modify their profile picture. There are three levels of profile: a) beginner (from 0 to 15 points); b) intermediate (from 20 to 150 points); c) master (more than 155 points). For each range of points, there are different animals that will appear in the profile. The more points the user gains, the bigger the animal will be.

– *Registration*

Registration permits users to write reviews, check notifications, and look at the personal profile. A username and a password are needed to be registered. Although users can provide an email, it is not necessary.

In addition, the Mind Inclusion APP has some features to reduce the potential risks that persons with intellectual disabilities are exposed to when using the internet and apps in general. In this regard, the Mind Inclusion APP was designed without any social media goal and not permitting the interaction of persons with intellectual disabilities when using the APP, minimizing the risks of the internet as cyberbullying. Moreover, this project follows a technological and pedagogical

framework, in which learning environments and situations were created and adapted to individual needs (through a co-creation process). In these conditions, in fact, the APP works to support persons with intellectual disabilities to augment existing abilities, compensate for or bypass difficulties they may experience (Chambers, 2020; Scherer, 2011). Particularly, persons with disabilities are able to improve their digital literacy through this APP and the help of their caregivers (Heitplatz, 2020).

In conclusion, the Mind Inclusion APP has an impact on the lives of persons with intellectual disabilities at different levels: (i) better engagement in basic leisure, (ii) positive influence on self-determination and (iii) positive influence on community living and participation.

4. Conclusions

The Mind Inclusion APP is a tool that allows persons with intellectual disabilities to find leisure options in their community, fostering further opportunities for social inclusion. The APP was developed under a co-creation process, considering the Design Thinking (DT), Mindful Design Framework and the Agile Method as well as the own Mind Inclusion facilitation methodology rooted in the Ecological theory and Capability approach (Biggeri, 2010). These approaches permitted the involvement of persons with intellectual disabilities during the whole process of the APP co-design and co-production.

Beyond searching for a location or an activity according to IDP needs in their community, the Mind Inclusion APP allows persons with intellectual disabilities to rate the location or activity according to its accessible means. This feature of the APP allows persons with intellectual disabilities to know which places in their community are more suitable for them and, therefore, to foster their self-determination when it comes to decide where they want to go, or what kind of activity they prefer to do.

In addition, the Mind Inclusion APP has been designed to have an impact on persons with intellectual disabilities' social inclusion. By knowing the different leisure options in their community they can try different places and activities, improving their chances of meeting new people and, therefore, expand their social circle. Specifically, the APP contributes to increased autonomy and greater independence, removing barriers to inclusion. Thanks to this APP, persons with disabilities can interact better, be part of their society more easily, and learn new skills reducing the impact of disability on daily functioning. Furthermore, the APP is able to promote different types of autonomy such as knowledge and liberty, reducing dependency to others and supporting one to discover new situations and experiences (O'Brolchain, 2018). At the end, the last impact of the APP on persons with intellectual disabilities is the opportunity to make choices according to their own personal preferences and goals. Access to AT should be a right and not a privilege since AT can be used to increase equitable access to academic and social activities (Devi, 2019). The APP, in fact, is a tool that permits an empowering and a self-determination process, helping persons to "learn to gain mastery and control developing awareness of their environment, and participate in decisions that affect their lives" (Wass, 2020).

Furthermore, the Mind Inclusion APP not only benefits persons with intellectual disabilities but business users and other places' owners. The APP allows persons with intellectual disabilities to share their opinions and points of view about public places and their cognitive accessibility level. Consequently, it provides relevant information to Business users to improve accessibility in their places, having a double effect: raising awareness regarding the needs of persons with intellectual disabilities and improving their sense of belonging to their community.

In conclusion, this project focused on approaches such as co-design, co-creation and co-participation, with the further goal to improve and contribute to the inclusive research in which persons with disabilities are not only objectives of study but actors and co-researchers of projects.

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