DEEP

HANDBOOK

DEEP Project

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PART III: EVALUATION TOOLS OF DEEP TRAINING MODEL

Introduction

In the current social context characterized by the global aging of the population, the number of disabled people is set to increase. According to the survey on health and social inclusion in Europe (Eurostat 2016), there are 70 million people with disabilities over the age of 15.
At European level, by 2020 it is expected that one fifth of the population will have some form of disability.
The EU and all its Member States are contracting parties to the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD). For the EU, this treaty inspired the content of the European Disability Strategy 2021-2030.
Within this social framework, a change of logic in taking care of the disabled is fundamental, which is no longer purely "welfare", but which is oriented towards the development of autonomy, social inclusion, and prevention of forms of of marginalization.

The DEEP project starts from the assumption that in order to face these social changes and the challenges that derive from them, it is crucial an innovative training that is able to bring together professionals belonging to different professional categories (health professionals, occupational therapists and experts in the 3D printer sector), overcoming the current logic that disability is a topic limited to specific sectors and embracing the broad vision that touches all areas of society.
This training model will aim to bring the socio-health world closer to the potential of using 3D prints in the world of disability and to increase motivational and pro-social skills in target professionals, essential for relating to people with disabilities.

To create this multidisciplinary and multi-actor training model, a report was initially produced "The State of the Art of the DEEP Project" (for further information visit the website www.deepprojecterasmus.eu) considered a first intellectual milestone and achieved thanks to the contribution and expertise of each partner.
Thanks to the production of this report, the partners shared how to best structure a "training kit" that is able to create innovative training experiences that aim to bring the world of disability closer to that of 3D printing.

This training manual will be structured in three parts:

- **Part I** containing the 5 modules used to train professionals during the pilot courses organized in the 4 partner countries (Italy, Spain, Czech Republic and Luxembourg)
- **Part II** which contains the methodological guidelines of the prosocial and motivational models. This section is particularly useful for target professionals who will want to test the skills achieve in their working context.
- **Part III** in which are attached both the tools used during the training course for expert health professionals and makers (direct target) and in the path to examine the skills of the indirect target (people with disabilities).

PART I TRAINING MODEL DEEP: MODULES

Premise

The modules you find in the first part of the DEEP manual have been designed to provide multidisciplinary and multi-actor training for professionals interested in various skills in disability: healthcare professionals, occupational therapists, and makers.
These modules were created by the partners of the DEEP project to foster the mutual exchange of knowledge, skills and experiences among the target professionals: therefore, the specific work that these different realities carry out in their sectors have been combined in a multidisciplinary approach. This contributes to breaking down specialized terminologies, creating a multi-actor network and promoting a common language that is understandable to all.

MODULE I: Disability and the bio-psycho-social model

Theoretical part

What does disability mean?

Over 1 billion people, about 15% of the population, have some form of disability, and at least 1/5 of these people, about 110-190 million, face "very significant" difficulties in their daily lives. In addition, about 80% of people with disabilities live in developing countries, where 1/3 of school-age children have a disability. In the EU, the percentage of people with disabilities is at least 50 million (10.8%) (World Report On Disability, WHO, 2011). People with disabilities in Italy are 5.2%, about 3.1 million people, of which: about 1.5 million over 75, about 284000 students with disabilities, 27% live alone while 61% live in families (ISTAT, 2017). The main difficulties encountered by people with disabilities include: discrimination, lack of health care, lack of rehabilitation and architectural barriers (inaccessible public transport, buildings and information technology). This leads to consequences such as poorer

health, limited training and employment opportunities, poverty and lower educational attainment.

Historical-social evolution of the construct

The concept of disability has evolved over a long period of time, both socially, culturally and historically. Since ancient times, disability has been considered a problem, a defect. In the Greek-Roman age, deformity and disease were not tolerated because they were associated with guilt and divine will. Indeed, people with disabilities were seen as scapegoats to be blamed for destructive natural events, or the faults of the community. In the New Testament, unlike the Old Testament, the person with a disability is considered as part of the community. The disability of people is read as a warning for the faithful to do good works and exercise charity toward the needy, poor sick or crippled. Despite this period of apparent inclusion, from the thirteenth century onwards, the first asylums were

born, such as St. Mary Bethlehem Hospital, known to history as Bed-lem, famous for the brutal and inhumane treatment reserved for patients. In the early 1800s, a new ideology, "Social Darwinism," developed with the rise of the bourgeoisie. According to this ideology, the fittest survive so the answer to all those who do not participate in productive life because they are abnormal or deviant is institutionalization; thus orphanages, asylums, hospitals and prisons spread. In the late 1800s, the English anthropologist Francis Galton, introduced the term "eugenics," the purpose of which was to rid humanity of disease and imperfection by encouraging the reproduction of the best individuals and discouraging that of individuals with some form of physical and mental disability (Brambilla, 2009). Italian scientists were also influenced by the eugenics current from the 20th century, its expression culminating with the advent of fascism.

Similarly, in Germany, the German National Socialists, in the thirties of the twentieth century, adopted the most radical and violent measures of forced sterilization, whose objective was to eliminate disability.

Subsequently, Franco Basaglia, an Italian psychiatrist and neurologist, began in Gorizia an experience that represents the first Italian attempt to propose an alternative to a reality that he tenaciously rejected: the asylum. In 1978, Law 180 was passed, the so-called Basaglia law on "Voluntary and Compulsory Health Care Assessments and Treatment", through which asylums were closed and the institution of forced hospitalization in psychiatry was regulated.

The World Health Organization (WHO), in 1980 defined disability in the "International Classification of Impairments, Disabilities and Existential Disadvantages", distinguishing three levels:

- Impairment: any permanent loss or abnormality to an anatomical structure or psychological, physiological, or anatomical function (externalization);
- Disability: any limitation or loss (resulting from impairment) of the ability to perform a basic activity (such as walking, eating, working) in the manner or extent considered normal for a human being (objectification);
- Handicap: the condition of disadvantage, resulting from an impairment or disability, which in a certain subject limit or prevents the fulfilment of a social role considered normal in relation to age, gender, socio-cultural context of the person (socialization).

In 1999 the WHO published the new "International Classification of Impairments, Personal Activities (ex-Disability) and Social Participation (ex-Handicap or Existential Disadvantage)" (ICIDH-2). (ICIDH-2), in which two of the three carrier concepts that characterize a morbid process are redefined:

- its exteriorization: impairment
- objectification: no longer disabilities but personal activities
- the social consequences: no longer handicap or disadvantage but different social participation

More specifically:

- personal activities refers to the limitations of nature, duration, and quality that a person suffers in his or her activities, at any level of complexity, due to a structural or functional impairment. Based on this definition, every person is differently abled.
- social participation refers to the restrictions in nature, duration, and quality that a person experiences in all areas or aspects of his or her life (spheres) due to the interaction of impairments, activities, and contextual factors.

In the new WHO Classification, the term "handicap" has been definitively set aside given its confusing and pejorative connotation.

While specifically, the term "disability" means the reduction or loss of an ability to perform an activity considered normal for the context of reference. People with disabilities are defined as those with enduring physical, mental, intellectual or sensory impairments that in interaction with barriers of various kinds can hinder their full and effective participation in society on an equal basis with others (ONU, 2006).

International Classification Systems on Disability

The evolution of the concept of disability has led to an evolution of its system of classification and evaluation. The ICF (International Classification of Functioning) is proposed as a bio-psycho-social classification model that is decidedly attentive to the interaction between a person's ability to function and the social, cultural and personal context in which they live. The ICF is derived from the 1980 ICIDH classification and complements the ICD-10 classification, which provides information on the diagnosis and etiology of disease. The ICF does not contain references to disease, disability, and handicap, but focuses positively on function,

structure, activity, and participation. Specifically, the ICF: describes and measures health and disability in a given population; describes what can occur in conjunction with a given health condition; is applicable to everyone; views disability in relation to a person's contextual and life factors; and describes functioning as a continuum, without categorizing disabilities.

Each part consists of two components:

PART 1: Components of Functioning and Disability

The Body component includes two classifications, one for the functions of body systems (physiological and psychological functions of body systems) and one for body structures (anatomical parts and body functions). Chapters in the two classifications are organized by body systems.

The component of Activity (performance of a task or action by individual) and Participation (involvement in a life situation) encompasses the full range of domains indicating aspects of functioning from both an individual and social perspective.

PART 2: Components of Contextual Factors

The first component of Contextual Factors is a list of Environmental Factors (attitudes, physical and social environment in which people live). Environmental Factors impact all components of functioning and disability and are organized in an order from the environment closest to the person to the more general environment.

Personal Factors (attitudes, personality, education, culture, lifestyles) are also a component of Contextual Factors, but are not classified in the ICF because of the great social and cultural variability associated with them.
Any environmental factor can positively modify a person's functioning in a given activity, i.e., be a facilitator, or limit functioning, creating or amplifying a person's disability.

The assessment of functioning must specify the context of a person's life. It is different to assess an individual's functioning at home or in a ward, in an adapted setting or one with physical or relational barriers to participation, in a familiar or unfamiliar environment. Applying ICD-10 and ICF in a complementary manner can provide a comprehensive picture of the individual's disease and health status functioning.

First ICIDH and then ICF proved unable to describe in detail and accurately the functional profile of developmental individuals because they do not contain categories representing the specific developmental characteristics of children and youth. Therefore, a specific classification for the developmental age was developed.

The "International Classification of Functioning, Disability and Health for Children and Youth", now called ICF-CY for short, is the first classification derived directly from the ICF, with which it is fully compatible, covering the age range from birth to eighteen years of life. ICF-CY expands the coverage of the ICF through the addition of content and greater detail aimed at capturing the specific body functions and structures, activities, participation, and environments of infants, children, preadolescents, and adolescents.

ICF-CY, like ICF, should be used in a complementary manner to ICD-10.

From a practical standpoint, it was necessary to create a classification that takes into account the changes associated with growth and development; moreover, manifestations of functioning, disability, and health conditions in childhood and adolescence are different in nature, impact, intensity, and consequences from those in adults. From a philosophical point of view, it was essential that a classification, aimed at describing the health and functioning of children and adolescents, be in accordance with international conventions and declarations for the protection of children's rights, so that it could be evidence, support and empirical foundation to ensure the rights of children and adolescents.

In adapting the content of the ICF to the ICF-CY, particular attention was paid to four key issues:

Development is a dynamic process in which the child's functioning depends on ongoing interactions with family or other caregivers in the immediate social environment and cannot be understood by seeing the child in isolation. At this developmental stage, the influence of the family is greater than in adult life.

In children and adolescents, the timing of the appearance of certain bodily functions or structures and the acquisition of certain skills may vary according to individual differences or physical and psychological factors in the environment; thus, it is important to keep in mind that the failure to appear in functions, structures, or skills may not be permanent but reflect a developmental delay.

Participation, defined as "involvement in a life situation," particularly in the young child, is defined by parents, caregivers, or service providers.

The nature and complexity of children's environments change dramatically as they grow; furthermore, considering the position of dependency in which children find themselves during development, the environment has a significant impact on their functioning.

Another standardized planning and assessment tool used and well-known in Italy is the VADO (Assessment of Abilities and Definition of Objectives).

VADO is an innovative tool for the assessment and planning of individualized rehabilitation interventions with people who have personal, relational and social disabilities due to mental distress. Specifically, the purpose of VADO is to define the objectives of an individualized rehabilitation program for people who have difficulty in carrying out activities of daily living, to have a satisfactory relational life and, more generally, to be autonomous and evaluate the progress of the program over time, in terms of objectives and outcomes achieved. The VADO is therefore built on two fundamental components: a first component related to the evaluation of the patient, and a second one related to the planning and conduct of the rehabilitation program. The Functioning Assessment (FEA) interview can be used in whole or in part to gather the necessary information.

The components considered in the interview are:

1. Self Care
2. Clothing care
3. Caring for your physical health
4. Taking care of your mental health
5. Home
6. Living area
7. Caring for one's living space and collaborating on domestic activities
8. Productive and/or socially useful activities/study
9. Amount and type of daily activities
10. Movement speed
11. Participation in the life of the residence or day care center
11. Participation in family life
12. Affective life, sexual and sentimental aspects
13. Child care
14. Frequency of "external" social relationships
15. Friendship and helping relationships
16. Aggression control
17. Other rules of coexistence

18. Security
19. Interests
20. General Information
21. Education level
22. Money Management
23. Travel and use of transportation
24. Phone usage
25. Shopping and running errands
26. Facing emergency
27. Income and application for pensions and benefits

But also: current and previous strengths and resources

The results of the assessment are reported synthetically on the Personal and Social Functioning (FPS) scale and, more operationally, on the Rehabilitation Areas (AR) form. The areas of functioning assessed are:

- Care for yourself and the environment
- Family and social relationships
- Work/study and community service activities
- Aggressive or disturbing behaviour
-

Then to develop the rehabilitation program are defined:

- Overall Goal: To bring the patient to live, work, and experience new things in the environment of his or her choice, as independently as possible given the starting conditions;
- General objective: concerns the area in which it was decided to intervene;
- Specific goals: operationally defined, achievable in a few months. (Morosini et al., 1998)

Nowadays, in light of the current classification systems, disabilities were categorized as:

- **SENSORY DISABILITIES:** disabilities that affect the senses (sight, hearing, but also touch, taste, smell);

This expression primarily denotes three types of disabilities:

- Blindness or low vision with vision not exceeding 3/10;

- Deafness or hearing loss with hearing loss greater than 25 decibels in both ears;
- deaf blindness characterized by the coexistence of the two sensory disabilities visual and auditory.

Sensory impairment often affects relationships and communication. A visual impairment or dysfunction does not allow a person to fully grasp the non-verbal communication of his or her interlocutor and, in the same way, a hearing impairment or dysfunction does not allow a person to clearly perceive what is being said by another person. But it also affects one's own independence and everyday life.

- **MOTOR DISABILITIES**: they concern the motility and efficiency of the organs of the parts of the body deputies to the movement;

The main motor disabilities concern posture, coordination and muscle tone. The disabled person, therefore, is unable to maintain the "tonic dialogue" between the surrounding environment and his or her own ability to move. Some declinations of this type of disability are:

- Infantile cerebral palsy, these motor disabilities affect two children in every thousand, already during the first months of life show difficulties of varying intensity in the movement that can affect one or more limbs, from monoplegia that affects only one limb to tetraplegia that affects all four limbs;
- encephalopathies, which are genetic in nature, manifest as tremors, rhythmic body oscillations, and muscle changes between antagonistic muscles;
- Dysgraphia, the inability to produce good quality writing, is often a disorder that affects the psychological side of the student and requires in-depth analysis of both school and family dynamics;
- motor impediment, concerns subjects who present nervous tics, involuntary movements that the subject makes in a situation of great discomfort. Generally, do not limit the daily life of the subject, except in some cases where they occur in severe form including Tourette's syndrome which also involves a continuous repetition of sounds such as grunts, barks and sounds due to swallowing.

- **INTELLECTUAL DISABILITIES**: they concern both the intellectual abilities that can be verified through the IQ (IQ: ratio between chronological age and mental age of the subject), and more specific disabilities such as mental deficiencies (M.I.) and specific learning disabilities (e.g. dyslexia, dysgraphia, dyscalculia, etc.);

In DSM-IV-TR, the actual concept of intellectual disability was indicated by the diagnostic category of Mental Retardation, while in DSM-5, the term mental retardation has been officially replaced by intellectual disability (intellectual developmental disorder). It is a disorder with onset in developmental age that includes intellectual and adaptive deficits in the areas of conceptualization, socialization, and practical skills, and 4 levels of severity (mild, moderate, severe, and very severe) are separated.

- **MENTALITY DISABILITIES**: pertains to mental and relational problems (psychosis) and psychological problems (only severe and disabling neuroses).

The subject with a psychiatric disability appears incapable, in part or totally, of fulfilling the social role required of him/her by his/her family and, in general, by the context in which he/she lives.

The subject with a psychiatric disability appears incapable, in part or totally, of fulfilling the social role required of him/her by his/her family and, in general, by the context in which he/she lives. We speak of primary disability to define the intrinsic damage induced by the psychiatric illness, which determines the problems and conflicts with the family and the social environment. Secondary disability is the adverse personal reactions. The effects of a severe mental crisis may, for example, be a total loss of self-esteem or, conversely, denial of the disorder itself. Tertiary disability is constituted by the social handicaps resulting from the disease: poverty, loneliness, lack of work and housing are factors that amplify the basic disease, leading the patient to a condition of insecurity and progressive isolation.

In reality, disabilities often exist side by side: in this case we can speak of multiple disabilities. It is sometimes possible to specify the main disability and the associated

disability. The presence of disabilities very often creates psychological and relational problems.

European regulatory system on disability and inclusion

The European Union began to address disability from the second half of the 1970s (Priestley, 2007). The approval of the European Community Disability Strategy in 1996 represents the first recognition of disability as an area of European policy and the first real affirmation of the need to protect the rights of people with disabilities through a series of integrated and coordinated actions. The Strategy in question was characterized by a change in perspective inspired by the Standard Rules for the Equalisation of Opportunities for People with Disabilities (approved by the United Nations in 1993) and by the emergence of the so-called "social model of disability" (Barnes, 2008), which conceives of disability as a consequence of social factors and not as a consequence of an individual's impairment.

With the entry into force of the Treaty of Amsterdam in 1999, the EU acquired the power to adopt measures to combat discrimination inter alia based on disability (Article 13 TEC, now Article 19 TFEU).

In 2000, the Nice European Council approved the Charter of Fundamental Rights of the European Union, which includes two measures specifically related to disability. Article 21 affirms the principle of non-discrimination, while Article 26 states that the EU "recognizes and respects the right of persons with disabilities to benefit from measures designed to ensure their independence, social and occupational integration and participation in the life of the community" (Ferri, 2016).

In 2009, the entry into force of the Lisbon Treaty brought about a substantial change in the status of the Charter of Fundamental Rights of the EU: it was given the same (binding) legal value as the Treaties, thus making it a source of primary law.
Subsequently, the Commission adopted the European Disability Strategy 2010-2020. This new Strategy appears to be strongly influenced by the social model (Barnes, 2008) and the ONU Convention (2006), its conceptual and programmatic pivot is the elimination of barriers in favour of the participation of disabled people in the social, cultural and economic life. The main new element lies in the identification of eight specific areas in which the European Union proposes to act in conjunction with the Member States: accessibility, participation, equality, employment, education and training, social protection and health (Ferri, 2016).

Despite all the efforts undertaken, the European Commission recognizes that people with disabilities still remain at greater risk of poverty and social exclusion than people without disabilities. Moreover, the COVID-19 pandemic has exacerbated existing inequalities. Therefore, a new strategy was proposed: the European Strategy 2021-2030.

Furthermore, in 2024, the Commission itself, in cooperation with the Member States, intends to introduce a European quality framework for excellent social services for people with disabilities; to have concrete initiatives taken at the national level on access to inclusive schools, justice, and health care; and to strengthen the participation of people with disabilities in arts and culture, recreation, sports, and tourism (European Commission Communication, 2010, 2021).

Practical Part

This section of the DEEP model will describe some practical activities that trainers can do and can have their learners do, allowing them to experience and understand, through simulations games and group work, disability and its different languages. These activities allow them to fully develop, through knowledge and awareness of diversity, potential, learning, collaboration, reciprocity, stereotypes and prejudices, resulting from the encounter with disability.

TARGETS: Health professionals, makers, educators, teachers, social workers, parents, adolescents, mediators, cultural workers and all those interested in experiencing disability and its different languages.

1. What is Disability?

Purpose: Learn about disability, identify and discuss stereotypes regarding the concept of disability

Time: 30 minutes

Materials: Blackboard or poster board

Conduction:

In the first phase we ask learners to explain what disability is: "Who is the person with a disability?" What can he/she do and what cannot he/she do? We record their answers on a poster or blackboard, refraining from judgment and any comments.

In the second phase we try to eliminate, together with the learners, the answers that represent obvious stereotypes, stimulating their reflections about them. For example, if someone claims that the disabled person "can't play sports," "can't go out and have fun," we try to involve everyone in analyzing whether the claim can be supported or whether it represents only prejudice.

In Step Three: we identify the most significant responses and try to develop them together with the learners. The banal affirmation "he is different" can be a fertile ground for addressing the issue of diversity and for understanding how people can be different. The same can be said with affirmations such as "unfortunate people" or "unhappy people": these are considerations that open the space for broad discussions.

2. Primary representational system

Purpose: Determine the main representational system you work with (Visual, Auditory or Kinesthetic)

Time: 20 minutes

Materials: Test, pen and paper

Conduction:

In the first stage explain the Primary Representational System.

System that codify most information from reality. Whenever a person interacts with the world around him or her, he or she does so through the 5 senses, but the channels on which communication moves can be traced back to three: - Kinesthetic (touch, taste and smell); - Visual (visual capacity, images); Auditory (sounds, words, noises). The ways in which people codify language, organize and give meaning to experiences are visual, kinaesthetic and auditory. So in interactions with people, it is necessary to put attention and understand the representational system with which the person is processing information. In particular, in sensory impairment there is a tendency to develop one channel more than the other depending on the type of sense impaired, so it is crucial to understand what type of representational system is being used in order to facilitate communication.

In the second phase, deliver the test to each participant.

Explain to the learners that this is a self-assessment test to determine the primary representational system with which they operate. The test consists of 10 multiple choice questions with 3 alternatives A, B and C. The learner must read the question carefully and choose one of the alternatives by marking with an X the answer that best represents his or her thinking on the topic in question. For greater credibility of the test outcome, it is recommended to answer immediately.

NAME: _____ DATE: _____

TEST FOR THE ASSESSMENT OF THE PRIMARY REPRESENTATIONAL SYSTEM

Discover your preferred way of thinking and interpreting the world – your preferred Representational System: Visual, Auditory, Kinesthetic.
Read each statement carefully and consider the 3 answers A, B and C.
Mark with an X the answer that best represents your thoughts on the topic in question.

1) When you feel hurt, what is your immediate response:
___ A. I see the wound as amplified
___ B. I hear the impact sound
___ C. I feel a sensation of pain

2) When you have to pronounce a new or difficult word:
___ A. You visualise it on a board
___ B. You hear its sound
___ C. You start writing it

3) When you happen to read:
___ A. You see the images of what you read
___ B. You repeat the words in yourself
___ C. You feel the action and movement

4) When you are thinking
___ A. You see your thoughts as a film
___ B. You talk to yourself
___ C. You are distracted by external activities

5) When you are thinking:
___ A. You daydream
___ B. You listen to conversations on the radio
___ C. You get wild and dance

6) If you buy a "Do-it-yourself kit", what do you do:
___ A. You look at the pictures on the instructions
___ B. You read the instructions out loud
___ C. You start to assemble and complete it by trial and error.

7) Who is most attractive or interesting to you:
___ A. The person who gives a good image of himself/herself
___ B. The person with a nice persuasive voice
___ C. The person who gives a good feeling by touching

8) When you go to the cinema or watch TV:
___ A. You are fascinated by images of faraway places
___ B. You enjoy the dialogues of challenging films
___ C. You get bored and think you could go and do something else

9) When you make a speech:
___ A. You speak by moving your hands
___ B. You listen by telling yourself what to say
___ C. You speak more slowly than other people

10) When you are relating with others:
___ A. You imagine them taller, fatter, closer or different; you pay special attention to some unusual feature
___ B. You find it easy to follow what they say, you joke and converse with them without feeling lost.
___ C. You get close to them to feel their energy

Answers A= ___ Answers B= ___ Answers C= ___

In the third step, ask the learners to add up the answers and explain that more answers A indicates the Visual system, more answers B indicates the Auditory system, and more answers C indicates the Kinesthetic system.

3. The Confine of Contact - Which part of my body?

Purpose: Experience the 5 senses, work on the senses to relate to the world around us and understand sensory disability

Time: 30 minutes

Materials: Silicone plugs; eye bands

Conduction:

Begin by recommending silence during the experience unless hearing has been chosen as a means of understanding the world. Ask the group to move around the room making contact with the environment. Give directions for them to move forward and at different speeds, pointing out how behavior can affect the way we see the world. Let the group experiment with running or stopping suddenly or distracted walking. Next, communicate to the learners to freeze in the position they are in. Ask learners to either stop and contact the person nearest to them or to proceed slowly and carefully choose the person with whom they want to share the experience.

Once the groups of two have been formed, tell the participants that the experience will be about the five senses; they will start with sight. At this point, one person in the pair will say that the other will help them learn about the world through sight. It will be taken around exploring according to each other's ways and intentions. You then repeat the experience by reversing the roles in the pair. When one sense is being used, all others should be disabled. So, for example, when switching to the sense of smell, and everyone is smelling around the room, the eyes will be closed and the hands in the pockets.

It is preferable to eliminate hearing as well, using, for example, silicone earplugs, so the experience turns out to be much stronger. When touch is experienced, the person will begin to touch others in the room and will be helped by the partner in exploration since they will have their eyes and ears closed.

It is necessary for the trainer to control the exploration at all times and explain what to do through directions throughout the exercise. The exercise will end when everyone has experienced each sense.

4. Running as a disabled person

Purpose: Experiencing, reflecting and understanding physical disability

Time: 30/40 minutes

Materials: Paper, Pens, Markers, Bandage, Pendulum, Earplugs

Conduction:

1. If necessary, divide the group into sub-groups of five to eight people.

2. Explain to the group that in 20 to 25 minutes they must do some tasks. Some of these tasks will be done by the whole group together, no one excluded. Others are permanent tasks, such as that of the pendulum that must always keep swinging while the other activities are being carried out.

Examples of group activities may be:

- Draw a group portrait (each group member contributes to the drawing). - Write a song about the formation (each group member proposes a verse). -Build paper boats for each group member.

The activities are free and it is possible to identify additional ones or adapt previous ones to the group. While carrying out these activities, each group must continue to swing the pendulum without ever making it stop or identifying another activity that is permanent.

3. in addition, some people have to pretend to be disabled. They will be bandaged, put earplugs in their ears, two will be tied together, someone will be forbidden to say yes or no, someone else will be forbidden to speak at all, someone will not be allowed to use their right arm, etc. Explain again that all of this must take place within 20 to 25 minutes and that other groups are not allowed to be impeded.

4. Despite these disabilities, the group should continue to carry out its tasks. There should be an observer in each group to see that all rules are followed and all activities are carried out by the entire group.

5. After 25 minutes, the groups present the results of their work and discuss the difficulties they encountered.

Reflection and evaluation:

- How does it feel to have no physical limitations?

- What does it feel like to be disabled?

- Did the group work?

- Did the group offer support to those who had disabilities?

- Did being disabled also mean not participating in any initiatives?

- In what other cases can one be disabled?

5. Activities of the prisoner

Purpose: Experiencing, reflecting and understanding cognitive disability

Time: 30/40 minutes

Materials: Poster or blackboard

Conduction:

Begin by asking a participant to volunteer and impersonate a person with severe cognitive disability: he or she will be unable to move or speak, but can communicate only by moving a finger or through the eyes (other limited modes of communication may be chosen).

The person, whom we will identify as the prisoner, will have two needs that may relate to daily needs that he cannot cope with on his own: eating, drinking, blowing his nose, scratching his head, etc., or he may have more complex needs: being hot, cold, sore, bothered by light or needing a specific object.

The other participants will be divided into two groups, with group 1 having the task of understanding the prisoner's needs and wants, and group 2 having to write down their observations on a sheet of paper, focusing special attention on nonverbal behaviors to try to infer the emotions experienced.

Participants then, through nonverbal communication, will try to understand the prisoner's needs. It will be the tutor's task to guide them, spur them on to identify communication strategies. For example, the tutor may suggest identifying a gesture to indicate yes and one for no. The tutor's task is to stimulate participants toward understanding the needs of the prisoner, who will only be able to see his or her needs met if understood. Once the need is discovered, they will move on to the satisfaction of the need.

After the activity is over, the emotions experienced by all participants will be reported on a poster board. The collection should reflect and report the emotions of both the prisoner and the group that was involved in caring for him or her.

Emotions of discomfort, sadness, anger over the communication difficulties encountered, embarrassment and shame over the physical contact that caring requires will be reported. Participants in group 1 will be able to help in verbalizing participants in group 2 by suggesting what emerged from their observations.

After this experience, reflection on the difficulties encountered in situations of severe communication impediment should be encouraged.

It can be asked: How would you feel if...?, How do we feel when we are misunderstood?

The tutor leads the discussion by reflecting on how our behavior can facilitate or impede the autonomy of people with disabilities.

6. COUNTER CARDS

Purpose: Try to emphasize or deconstruct common stereotypes associated with health and disability

Time: 30 minutes

Materials: Images

Conduction:

The counter cards are images that attempt to emphasize or otherwise deconstruct common stereotypes associated with health and disability. Choose14/18 images related to disability (see examples below). The cards can be used in pair or group activities. Print the images in color on thick paper.

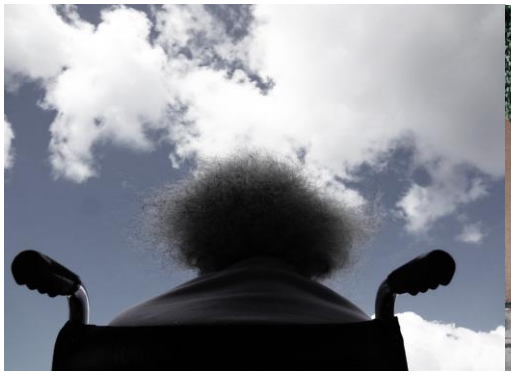
The first part involves the **INVENT STORIES** activity: Each participant is given at least three images from which he or she is asked to invent stories that have counter-stereotypes, positive and negative, at their center (e.g., a person with intellectual disabilities who is actually a drug dealer, a person with physical disabilities in a wheelchair who is a manager of a multinational corporation, etc.). To make the game more complex, it is possible to construct a single group story for which each

player takes turns participating by narrating an elaborate story from one of their own images.

The second part involves the **STEREOTYPES AGAINST HUMANITY** activity: Learners take turns drawing a card and saying the first thing that comes to their mind associated with the image, no matter how politically incorrect or stereotypical it is. The activity is ideal for activating group reflection.

The third part involves the **FIND THE CONTRARY** activity: Cards are placed on a plane with the images clearly visible. Having identified a card and its stereotype, each learner, in turn, selects another image that he or she believes is contrary and capable of challenging the meaning of the first.

Example images, COUNTER CARDS

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MODULE II: Prosocial communication model andprosociality

Origin of the concept of "Prosocial"

"Prosocial" is a concept that has arisen, basically, as an antonym of the "antisocial" concept, which studies and demonstrates the factors and benefits that the actions of help, solidarity, giving and sharing and co-operation, have for all the persons, groups or societies which are involved either as authors or receivers. Most of the authors use it as an adjective (something prosocial); Roche began to use the noun Prosociality to refer to this one not only to qualify actions, but also to name a model of thinking. The first evidence of the study of prosociality emerged in 1908, by McDougal, who suggested that the prosocial behaviours are the result of "tender emotions" created by the parental instinct (Penner et al., 2005). Nevertheless, scientists' attention on the study of prosocial behaviours is more recent, and arose from the case of Katherine "Kitty" Genovese in 1964, a young woman brutally murdered to the indifference of her neighbours. Since then, the study of prosocial behaviours developed from different perspectives, focusing more on the biological, motivational, cognitive or social processes involved (Penner et al., 2005) At interpersonal level, for example, many authors have examined cases where people help the others, their motivations to do so or simply why there are people who don't help at all. Only recently scientists have begun to include the idea of prosocial behaviours in the work environment (organisations) where it has been demonstrated to have important implications for the group climate. The line of work that we have been developing since 1984 in the Laboratorio de Investigación Prosocial Aplicada, (LIPA) of the Universitat Autònoma de Barcelona (UAB) centres not so much on the motivations which lie behind the prosocial behaviour, but rather on its optimisation: how to facilitate the occurrence of prosocial behaviours in the contexts in which we move, how they are propitiated, how we can increase them in quality and frequency.

PROSOCIALITY IN 1000 WORDS

The sentence "prosocial behavior" has gained a strong presence in the vocabulary and scientific research since the 70's (Brief and Motowidlo, 1986). Throughout the time, the studies on prosocial behavior have gained a place not only in the psychological area, but also in other sciences. Although the interest for the study of prosocial behavior has its origin and prevalence in the area of psychology, circa 45 disciplines or disciplinary areas are performing research on this matter.

And the range is very wide, from development psychology, multidisciplinary psychology, social psychology, education psychology and other disciplines, as for example, psychiatry, family studies, sociology, economy, neuroscience, sport science, communications, businesses, tourism, pediatrics, public health, anthropology, criminology, nuclear radiology, religion, among several more. (Escotorin, 2013). The interest for investigating the topic is increasing. The "prosocial subject" has positioned in the scientific research as a permanent topic and also in the regular speech of the persons. The use of the term is also installed in the most informative search engines, like Google. A simple search in Google about "prosocial behavior"1 provides around 365 thousand results; the Spanish term "comportamiento prosocial" delivers more than 9 thousand results; the adjective "prosocial", more than 1 million results. This increase in circulating material, together with the clear and fruitful production of scientific material about Prosocial Behavior, compel the specialized researchers to generate articles or books that organize- at least in part- the state of the question (Penner, Dovidio, Piliavin, Schroeder, 2005; Marti, 2010) and increase the doctoral theses, which, in their turn, continuously update the state of the art. In a recent study (Escotorin 2013) we have verified that there is a great interest on the part of the scientific community for deepening the basic research on Prosocial Behavior and less interest in applied research in intervention programs.

The prosocial matter and the theoretical approaches

Beyond the current discussion regarding the definition of prosocial as a more motivational or more behavioral concept (Martí, 2010) or as voluntary acts that benefit others, comprising both altruist and selfish motivations (Gummerum, 2005), seems to be an quite generalized agreement regarding the definition of prosocial. Caprara, Allesandri and Eisenberg (2012) agree in the following definition of prosocial behaviors that gathers the work of Batson, Eisenberg, Fabes, and Spinrad; Penner, Dovidio, Piliavin, and Schroeder: Prosocial behaviors refer to voluntary actions undertaken to benefit others, such as sharing, donating, caring, comforting, and helping (Caprara, Allesandri y Eisenberg, 2012, page 1289). At a specifically more communicational level, not all the definitions about "prosocial" include relational or interpersonal elements. According to some authors, the action of helping may be used to establish or to reinforce different status perceptions between "helper" and "receiver". The act of helping may create a sense of inferiority or dependency in the receiver (Penner, Dovidio, Piliavin y Schroeder, 2005) Regarding the prosocial issue, the literature uses action verbs, with the author giving a strong relevance to action verbs and omitting, most of the time, the behavior or reaction of the receiver of such behavior. We think this matrix does not disrupt the 97% of the existing researches, focused on observation and

the basic investigation of the prosocial issue; but it may disrupt the remaining 3% of the researches, which are focused on intervention or training on prosociality applied to specific contexts. From a functional point of view- which is the one that interest us on communicational interaction-, the verbs that define prosociality strongly highlighting the author's production or actuation, possibly generating side effects, as generating a sense of inferiority or dependence in the receiver of the prosocial action. If we only focus on transference and training, there may be applicative voids in the definitions that organize the concept within a general framework, leaving open the possibility of a great diversity of applications and interpretations. In the LIPA (Laboratorio de Investigación Prosocial Aplicada, Laboratory of Applied Prosocial Research) team, under prosocial behavior we understand the following: "those behaviors that, without expecting any extrinsic or material rewards, favor other persons or groups according to their criteria or in accordance to objectively positive social goals, increasing the probability of generating a good-quality and joint positive reciprocity in the interpersonal or social relationship, safeguarding identity, creativity and autonomous initiative of the individuals or groups involved" (Roche, 1995, p.16). This definition, that has been widely developed in previous publications (Roche, 1991, Roche, 1997b; Roche, 1999; Roche, 2004a; Roche, 1998), proposes the receiver as the last criterion. This is a highly significant aspect, since it supposes a fundamental appreciation within the current approaches that study and apply prosociality, often focused on the issuer of the action and not on the receiver of the action. Summarizing, a prosocial action is an action that benefits someone else in the way this would like to be benefited, what contrasts against a conception of "helping" actions, which within the model of prosociality do not include the circumstances, needs, identity and culture of the receiver. Incorporating the reality of the other person in the definition of prosociality itself, avoids the risk of accepting as prosocial actions, those that instead of providing a benefit to the other person, damage the other. For example: doing a favor with a good intention, for which the receiver did not thank, because it just didn't help him/her; generating dependent relationships; or, with no intention, making feel the other person undervalued.

When is it possible to qualify an action as prosocial?

An element to be emphasised in this definition is that even the prosocial actions carried out with the agreement of the receiver, must answer to certain quality standards if they are to safeguard the identity, autonomy, creativity and initiative of the individuals or groups involved. These conditions or requisites place a critical question, for example, on an action desired by a receiver and perceived by him or her as beneficial. However, if there were objective indicators which prove that

the abovementioned action is, in fact damaging, it would not be prosocial, from our perspective. For Roche there is a wide scale of actions in human interaction that would be considered to be prosocial behaviours and, therefore, not only those of help or those of donation. The author prepared a proposal of diverse categories of prosocial actions (Roche, 1995) amongst which there is naturally physical help, physical service, verbal help, verbal consolation, but also the actions of giving and sharing, the assertion and positive valuation of others, attentive listening, empathy, solidarity and positive presence and unit - each one with a precise operative definition. The prosocial aspect for this author in contrast to the previous ones, is linked to verbal and nonverbal actions, in a present or non-present way, that not only intends to be of benefit to others but to those that really carry them out.

Importance and benefits of prosociality

From a collective perspective, in the functionality of coexistence and harmony of people, groups and societies it is assumed that prosocial actions would produce a decrease in violent behaviour. Today, in the advances science is making in the social field, altogether with systemic theory, social constructionism, neocognitivism, humanism, behaviourism and positive psychology, there is probably no topic border of such transcendental consequences and social relevancy as this. Nowadays, these theories can no longer be understood as being one-way in the causality of events and human actions, but instead as something as fundamental as reciprocity, dynamics which are constructed, facilitated and promoted precisely by this prosocial action. In other words, the social frequency of prosocial behaviours would produce a multiplier effect across learning according to models, as well as by means of activation of a selective perception, or simply by activation of an response to the received benefit, through which reciprocity may take place. We would be talking about an improvement in social relations. Furthermore, psychology is currently discovering how the person who acts in a prosocial way obtains psychological benefits which represent a de-centralised psychic space, capacity of empathy and significant content, in relation to values, and therefore present in self-esteem perhaps through perception of achievement, efficacy, and, finally also the observation of the benefits that it brings to the receivers. It allows real empathic communication making dialogue that is possible between human systems (ideological or political) very diverse or even opposing. It is a moderator of ambition and power.

Prosocial action constitutes a perceptively clear, incisive stimulus aimed efficiently at the target and at the receiver to whom it channels attention and consideration. Conditions of high conscience and sensibility with regard to the action and its

roots, increasing their value and becoming real models. Therefore, it greatly increases the statistical possibilities so that the receiver him or herself becomes the initiator or author, in turn, of other similar actions. It is important to consider that the type of reciprocity to be promoted should not respond to expectations which could determine the behaviour of the receiver, either to implicit contracts of immediate alternation or in continuity or in an alternation postponed in time. It is precisely here that the truly prosocial action lies: it has to be carried out in a way in which the first target is good for others, not the author, although they could be foreseen, be deduced or have subsequent positive consequences for the author. If this is the case, the reciprocity that could take place would come to close a very positive circle of interrelation, always voluntary, but highly effective in the survival of the systems or human groups.

Operator of social transformation: The prosocial action provokes concentric positivity circles in the environment. It is always difficult to realise the real effects that a prosocial action can generate in receivers, which eventually become authors towards other people and situations. Therefore, the prosocial action sometimes becomes reciprocal. At other times it turns to other people, but it probably never remains inactive. Even for scientific methods it would be difficult to verify the positive multiplier effects of the prosocial action due to the progressive distancing and complexity of the various receivers, with an incidence often superior to the simple formula of transmission of one-to-one. In any case, it is a positive and progressive incidence in the wider social spectrum which can increase its power of transformation depending of the agent's-initiator's power involved in the sequence.

Prosociality: a sure way to build trusting relationships with patients and people with some degree of disability

Although the study of prosocial behaviour began in the realm of psychology to address all behaviour performed for the benefit of others, the concept has generated interest in medical circles for its potential for improving both the quality of medical attention and the health of the doctors themselves. Healthcare professions, like other social service professions, commonly are linked to the concept of altruism. Altruism is regarded in medical training to be a core ethical duty. The concept is predicated on the notion that doctors and socio sanitary home care professional engage in professional activity that exacts considerable costs from them, since they must abandon their own needs in order to devote their full energy and attention to the patients. While the altruism concept may be heroic, doctors and socio sanitary home care professional are not always able to apply it once they face the reality of their work. Moreover, altruism is not an

observable behaviour, meaning it is difficult to demand it or expect it from physicians once they begin practicing. Bishop, J. and Rees, C. (2007) proposed replacing, in medical training programs, the concept of altruism with that of prosocial behaviour, which is more balanced, applicable, observable, and measurable. The concept of prosocial behaviour also permits balancing the interests of doctors, their own self-care, and the interests of patients. Prosocial behaviour may be defined in the following manner: "those behaviours that, without seeking extrinsic or material compensation, favour other people or groups according to the criteria set by those, or favour objectively positive social aims, increasing the probability of generating a positive reciprocity marked by quality and solidarity in the ensuing interpersonal or social relationships, while safeguarding the identity, creativity, and initiative of the individuals or groups involved" (Roche, 1995, p.16). From this definition, we can extract that a prosocial action is one that effectively benefits patients in the manner that they desire, provided that the action strengthens the identity, creativity, autonomy, and initiative of both the patient and the doctor. An action would not be considered prosocial if, for example, despite the good intentions of the giver, the receiver viewed the action as a disservice, the action generated a dependent relationship in the long term, or the receiver interpreted it as a sign of underestimation. For Roche, a wide range of behaviours in human interaction may be considered prosocial behaviours, beyond simply those involving physical help. The author proposed diverse categories of actions qualifying as prosocial (Roche, 1995) among which are, of course, physical help, physical service, verbal help, and verbal consolation, but also the acts of giving and sharing, reassurance and positive evaluation of the receiver, deep listening, empathy, solidarity and positive presence, and unity. Each category was operationally defined (Roche, 2009).

The definitions of the 10 categories may be seen in the bibliography, and also are available in Spanish on the website www.prosocialidad.org.

How does one apply prosociality?

Everybody has at some time performed or received a prosocial action. These are everyday behaviours that occur quite often in the service professions. Although they have a spontaneous nature, the quality and frequency of these behaviours may be optimized and perfected. One way to do this is by communicating in a prosocial manner. By communicating more prosocially, not only can doctors avoid misunderstandings when they provide information, but they can also identify the communicative styles that they use in their own interpersonal relationships, even in private life.

The impact of our communicative style on our surroundings

Without a doubt, human communication moulds our personality in an important way: it has the potential to be, and often is, both therapeutic and destructive. Beyond its strict content, at a metacommunicational level, communication is a vehicle for wishes, aspirations, needs, and affirmation from others. Each spoken word gives rise to the next one. Each statement spurs a discussion…and perhaps even more: every thought inspires another one. We believe communication is a variable at the service of all others: as a builder of self-esteem (although communication also depends on self-esteem); as a vehicle for expressing affection and unity both verbally and nonverbally; as a means of managing marital relationships, family relationships, friendships, and professional relationships; and lastly, as a way of structuring the rules of these systems. A person's communicative style undoubtedly impacts any environment in which it takes place. Social service and health mediators sensitized to communicating not only effectively, but also in a "prosocial manner", can change or impact the environment they share with family, romantic partners, friends, patients, and colleagues. Therefore, optimizing the prosocial behaviour of doctors, nurses, psychologists, social workers, etc. not only makes sense, it can produce a true difference. Suppose we apply these principals to a lecture given by a doctor or a nurse concerning healthy habits for the elderly. A good lecturer would not be the one who talks "the best", "most beautifully", or "most fluidly", but rather the one who succeeds in using all of his or her social and communicative skills to generate interest in the topic and motivate the listeners. The success of a speech is not measured by the quality of the words or delivery (the oral intervention), but rather by the effects these have on the audience. If lecturers or speakers are excessively focused on factors like avoiding mistakes, themselves, the (legitimate) desire to do well, convincing the audience of their message, persuading the audience to change, or demonstrating expertise on the subject matter, then even if the speakers use correct language and handle themselves professionally they might not appeal to the listeners or motivate them. However, if a speech or an oral presentation is designed and presented in a way that considers the audience and its circumstances, then the speech is more likely to appeal to the audience, transfer understanding, communicate a new point of view, or bring a new topic into awareness. To achieve this effect, the speakers must not only speak, but observe their surroundings, listen to the audience, take interest in their problems, provide useful tools, use teaching strategies appropriate for the audience, manage time in a manner that is constructive for the audience, ask questions, and request feedback. If speaking to a large group of people, the speaker should structure his or her discourse around these peoples' perspectives. Even though it is a speech, not a dialogue, lecturers must learn to listen actively, that is, to give full

attention to comments or questions posed by the audience, and questions only once certain of their meaning. Listening actively entails welcoming, respecting, and valuing the audience member as a legitimate person with the right to speak, whether it is a child, an adult, a labourer or an intellectual. Active listening involves ridding oneself of pre-existing concepts, experiences, culture, or prejudice in order to welcome the audience openly, and setting about understanding the audience's uncertainty and point of view, even if different from that of the speaker. Good orators are aware of the context in which they speak, they respect every question, and when they respond to a question, they don't disregard or undervalue the question or the person who asked it. Listeners who feel identified, respected, and welcomed by the speaker will open their minds not only to the topic of discussion—even if the listeners disagree—but also to the speaker. Of course, the preceding analysis applies not only to speeches, but also to interacting with medical patients (e.g., explaining a medical treatment, suggesting a change in diet, recommending exercise), and interacting with colleagues (presenting a project to a team or to a colleague, espousing a complicated point of view to a superior). The Prosocial Communication model for interpersonal relationships can also be applied to written communication, the writing of work-related e-mails, communicating bad news, or giving criticism. Returning to our definition of prosociality, we can say that quality communication generates positive reciprocation in interpersonal and social relationships, and improves the identity, creativity, and initiative of the individuals or groups involved in the interaction. Thus, the goal is not to "inform" (deliver a message) but to reach an understanding (on points of agreement as well as those of disagreement). Establishing positive, quality communication requires listening skills and observing the context in which the communication takes place. Each communicative act is complex and unique: What is said (the content, or the "message") and how it is said (i.e., communication techniques, verbal and nonverbal methods, length of message, tone of voice, mood, etc.) depend on who speaks (the head doctor, the nurse, the pharmacist, a patient, a relative, somebody credible, somebody who the listeners don't trust, somebody with power, etc.), who is spoken to (friends, acquaintances, colleagues, relatives, patients, subordinates, the media, labour unions, grade school students, labourers, specialists, etc.), where the communication exchange takes place (on what continent, in what country, in what city, organization, conference room, in a theatre, on the street, at the clinic, in an emergency room, in the waiting room, in a hallway, etc.) and when or in what setting does it take place (in what season, what year, what time, in summer when it is 40°, in winter when it is 12° below zero, before/after what important event, after what noteworthy problem, under what health circumstances, life circumstances, etc.) For this reason, it is impossible to establish a recipe for "how to communicate effectively" with a patient. No recipe exists, because factors like

culture, identity, or the relationship between the particular people involved can determine the success or failure of the communication. Prosocial communication involves focusing on establishing an authentic relationship with the other person, which does not happen automatically. It entails striving for a "meeting" between the "me" and the "you", to develop a mutual understanding that serves as a foundation for making the best decisions in any situation. Performing quality communication undoubtedly might involve a cost to the people who initiate it, because receivers will not always have the ideal disposition. Despite the cost, it has been demonstrated that quality communication has multitudinous positive effects. Just as violence operates on laws that, unfortunately, always hold true—continuation, reciprocity, imitation, and violence begets violence (Lederach, 2000, p.88)—prosociality also entails continuation, reciprocity, imitation, and generating subsequent prosocial behavior, especially once people experience its benefits. Like LIPA, we do not suggest applying our communication model immediately to the professional realm. Doing so could be discouraging, because the professional environment is complicated and involves many variables. Our method is to start by trying to optimize communicative style in more familiar areas, such as with romantic partners, friends, and family. Then, once we experience the benefits, we can—if desired—make the qualitative "leap" to professional relationships. We should mention, this does not imply that we cannot apply the self-evaluation tools, included in our kit, directly to the field of health. We believe the kit can reinforce training and build on the proper use of skills in all the communicative realms that house social service and health mediators.

Prosocialisation of health encounters using Prosocial Communication

In the context of an educational meeting, whether it is between a teacher and a student, or a doctor and a patient, communicating prosocially fosters a relationship based on reciprocal appreciation and welfare of everyone involved. Communication in the health encounter should be guided by the act of prosocializing, or "the act of carrying out, in practice, one or more prosocial acts aimed at helping other people, attending to their needs and interests, promoting authentic interaction and social communication, and protecting the identity and dignity of the people or groups involved" (Juarez, 2008a, p.15) In our judgment, the factors of the Prosocial Communication model constitute important elements for analyzing medical relationships that involve oral or written interaction; dialogue, when providing prescriptions; and that involve two people with equal dignity in a context of unequal power, information, knowledge, experience, and expertise. Therefore, applying the PC model in this context requires practicing reciprocal esteem centred on actions that benefit well-being, identity, independence, and creativity, with a transforming dialogue appropriate everyone

involved. We consider it important to flesh out the idea of horizontality and symmetry in a prosocial doctor patient encounter. Reflecting on the idea of horizontality in the encounter, Roche (Juárez, 2008b) suggested that when there is unequal power, the person having more power should initiate the prosocial aspect of the relationship, while if power is balanced, everybody involved should initiate these behaviours. In relationships of asymmetrical power, the person with greater power has greater responsibility, and therefore must "be the first to act prosocially, yield power and resources, and share…" (Juárez, 2008b). The cited author proposed that the person having more power should increase prosociality in personal, human, and humanistic realms. This person should build on the already-existing positive elements, scarce as they may be, and value them, identify their source, and express the elements in a way that allows them to grow through quality communication, achieving a positive and prosocial exchange. Applying this concept to the doctor-patient educational relationship: the physician, who holds the power, can modify the power or reduce it, promoting its attenuation and therefore promoting horizontality in the relationship, without threatening or obstructing the authority the physician of course has, given his or her experience. To conclude, we would like to present an initial contribution from our research project still in progress (Juarez, 2009): we have created a list of observable, measurable, and quantifiable communicative actions which, according to a sample of Argentinian medical patients, are indicators of prosocial as opposed to unsatisfactory communication in doctors. It has interesting parallels with the corresponding indicators in educational settings

Some indicators of prosocial relationship with patients	
Homecare professional who give clear feedback	Feedback given by the socio sanitary home care professional (an explanation of a disease, the name of a disease afflicting the patient, a diagnosis, or a treatment) that qualifies as comprehensible, clarifying, well structured, is expressed in simple language from the perspective of the patient, is adequate and correct given the needs of the patient, and contributes to resolving or resolves completely the problem that brought the patient to the doctor.
socio sanitary home care professional who give prosocial feedback	Feedback given by the socio sanitary home care professional that displays an empathic manner on the part of the physician, reflected in a remark or behaviour that, from the perspective of the patients, indicates an understanding of their views, or indicates that the physician has put him/herself in their position and understands their emotions. One way for physicians to show prosocial empathy is by picking up the words of the patient, using and paraphrasing

	them. (See this behaviour in patients, also)
Socio sanitary home care professionalss who affirm the dignity of the patient	Do patients feel that their dignity is affirmed? This question may have as many answers as there are people, since each person has a unique history and set of needs. However, there may be some elements common to all people. Patients will gather that they are taken seriously, listened to, or that their needs are considered, when they perceive that their socio sanitary home care professional is concerned for or interested in them, manifested in: the socio sanitary home care professional identifying the patient as his/her own personal patient, calling the patient by name, being able to remember or bring to mind the patient's clinical history and link it to the current pathological picture, the patient perceiving seriousness in the socio sanitary home care professional's deliberation of the diagnosis, the socio sanitary home care professional ordering any clinical analyses needed to understand the problem when the patient has doubts, and the socio sanitary home care professional prescribing appropriate medication. Generally, all actions of interest related to the health or the integrity of the patient, going beyond the strict obligations of the socio sanitary home care professional.
Patients who ask	An indicator of a prosocial manner of communication may be that patients feel comfortable and have enough confidence to express their doubts. Patients who don't ask questions might send conflicting signals: perhaps they understand everything, or perhaps they understand nothing and are too ashamed or afraid to ask the socio sanitary home care professional for clarification.
Patients who paraphrase	The patient has learned something new and is able to repeat it thoroughly in his/her own words. If patients can paraphrase or quote detailed explanations or recommendations that the socio sanitary home care professional has just provided, or can talk about behaviours learned from the socio sanitary home care professional, it suggests the socio sanitary home care professional-patient encounter was satisfactory and that the socio sanitary home care professional succeeded in communicating his/her message appropriately.
Grateful patients	Indicators of prosocial communication by the socio sanitary home care professional may be expressions of gratitude by patients toward the socio sanitary home care professional or toward others; selecting that particular socio sanitary home care professional to handle a health problem; or recommending the physician to other people.

Empathy and prosocial communication

The indicators of a prosocial style of communication in the socio sanitary home care professional patient relationship may be applied to the professional relationships of any health mediator working with elderly people, whether the health mediator is a doctor, nurse, social worker, pharmacist, physical therapist, etc. In order to build relationships of trust, professionals who work in the dynamic of a "helping relationship" with their clients need to have a great capacity for empathy, which goes hand in hand with prosocial behaviour (Stiff, J., Price Dillard, J., Somera, L., Kim, H., & Sleight, 1988) But, what competencies must health professionals possess in order to perform well, to strengthen their own careers, and to develop over time? This question was a source of motivation for Spencer & Spencer (1993) when he saw that the knowledge with which professionals are educated does not always correspond to the tools that are necessary or useful for resolving real-life work-related conflicts. He created a method that has been applied since 1991 in 24 countries, in more than 100 studies (interviews of samples of professionals in all circles) to identify the competencies that are necessary for performing a job successfully and satisfactorily, and he detailed the method in a text called "competencies for of our people are For help and service professionals including nurses and doctors, the competencies of empathy, or the ability to establish credibility, achieve trust, and be judged positively by patients, are considered crucial. In the case of empathy (the ability to understand the patient's point of view), a scale was developed from -1 (minimum) to 5 (maximum) to indicate the level of empathy that a doctor or nurse expresses toward the patient. According to this study, the effectiveness of the service and the overall impact of the doctor are limited by the depth and accuracy of the doctor's interpersonal understanding. In this section we will not discuss Spencer's study in further detail, although it is useful, as a complement to the indicators proposed by Juarez, to present the table developed by Spencer & Spencer showing the possible of degrees of understanding a patient. The list was based on interviews conducted with a sample of doctors and social service and health mediators. The highest level of understanding was 5, and the lowest level of understanding, and hence the least desirable in terms of the success of the service, was -1. Interpersonal Understanding Scale (Spencer & Spencer, 1993, p.39)

DEPTH UNDERSTANDING OF OTHERS

-1	Lack of Understanding. Misunderstands or is surprised by others' feelings or actions; or sees others primarily in term of racial, cultural, or gender stereotypes.
0	Not Applicable. Or shows no explicit awareness of others, but no evidence of serious misunderstanding. This level is often found in combination with direct persuasion.
1	Understands Either Emotion or Content. Understands either present emotions or explicit content, but not both together.
2	Understands Both Emotion and Content. Understands both present emotions and explicit content.
3	Understands meanings. Understands current unspoken thoughts, concerns, or feelings; or gets others willingly to take actions desired by the speaker.
4	Understands underlying Issues. Understands underlying problems: the reason for someone's ongoing or long-term feelings, behaviours, or concerns; or presents a balanced view of someone's specific strengths and weaknesses.
5	Understands Complex Underlying Issues. Understands complex causes of others' long-term underlying attitudes, behaviour patterns, or problems.

The Prosocial Communication model

In the kit for mediators and operators, as well as in this manual, we discuss a practical self evaluation test. To understand the test better, in what follows, we present the 17 factors of the Prosocial Communication model, explained individually. This is meant to accompany the kit, to make it easier to understand, to resolve any ambiguities, and to answer any questions that may arise when health mediators or operators take the test. It is important to remember that this self-diagnostic test should be taken anonymously. Under no circumstances should people be asked to share their weaknesses with others, nor should they be obliged to turn in the test with their name or personal information on it. It is important to respect people's anonymity and to promote communication in which people share what they truly feel, their weak points, and their strong points, with someone with whom they feel comfortable. These exchanges are more likely to take place during a one-on-one conversation, in which people can express personal information. This could occur in a pleasant location, such as a garden. A second

test could be conducted with another partner, so that everyone can verbalize and receive feedback regarding their own communicative style at least two times, from two different listeners.

In what follows, we present the synthesis of the model.

1. Am I always available?

My availability as a receiver refers to having a positive attitude when people speak to me, or direct themselves to me in some way. Sometimes this calls for effort on my part to stop what I was doing and adapt to the person speaking to me.

To determine whether I am an available receiver, I can ask:

Do I briefly interrupt my activities to positively attend to the person speaking to me? Am I available? Do I demonstrate my availability to my patients, both verbally and nonverbally?

2. Am I an opportune communicator?

Many misunderstandings can be avoided simply by finding the right moment to speak with the other person. Perhaps when people are at home, after a stressful day of work, reproaching somebody because he or she made a mess has a higher probability of triggering an argument than it does at some other more relaxed moment. In work teams, misunderstandings, arguments, or tensions between

colleagues are common during periods of high work. Conflicts with the families of patients are more likely when people are tired, overworked, or stressed.

Before talking to people, do I check whether they have time? Do I ask myself whether their current mood (or mine) is suitable for the seriousness of the topic? Do I choose the appropriate time and place to initiate a conversation? Before giving a diagnosis, indicating a treatment, or providing information, do I make sure that emotional, spatial, and temporal circumstances are right for both the patient and myself?

3. "Emptying" myself to be completely receptive

For others to find us 100% receptive when they speak to us, we must actively "empty" ourselves. This can be a challenging task, but it is not impossible. Emptying oneself is not the same as eliminating or permanently forgetting your problems or opinions; rather, it is a short-lived exercise in putting aside your interpretations, prejudices, and problems so that they don't interfere with your ability to understand what another person is trying to say.

Do the people speaking with me with feel that their statements deserve my full attention? Do they feel that I am fully interested in what they are saying? Am I able to empty myself of all my concerns to attend completely to my conversation with the patient?

4. Do I live the present moment to the fullest?

Every person should know how to live fully and intensely in the present moment. According to Roche, people anchored in the past or focused on the future do not live, but rather "are lived". For instance, in a relationship, the principle entails considering the importance of "us": you and me, in the here and now, every instant. What we did in the past, what we will do in the future, or what we will cease to do, cannot and should not interfere with the present interaction. This is a healthy attitude that helps lay the groundwork upon which we can build an authentic relationship with any person, never mind romantic partners or our children. For instance, in the health field it is essential to be able to see patients while living in the present moment, putting aside the mental burden (sometimes a heavy burden) of all the things that need to be done later, or the large number of patients still waiting to be seen.

Do I have prejudices toward the other person because of a past experience? When we discuss a complicated topic, do I refer to events "of yesterday" or "of tomorrow" to discuss "now"? Do I concentrate 100% on the present moment with every patient, without distracting myself with past or future concerns?

5. Do I perceive myself to be an empathic person?

Much has been said and written about empathy, but probably the best judge of weather I am empathic or not is the person I am speaking to. Empathy involves a special ability to see things from the perspectives of other people, and even to

experience their emotions. Many people consider themselves to be tremendously empathic, but if they asked their romantic partner, children, or friends if they are empathic, the answers might be surprising. Empathy can be learned, if we develop the habit of giving feedback to others ("are you okay?" "You don't look well"), for instance, by practicing the greeting, a very important moment for the relationship, or our non-verbal communication (Roche, 2006). We referred to empathy emanating from "me", which would be considered empathy only if "you" somehow noticed that I am expressing it. Here, we add two new concepts to that of empathy: reciprocity and unity, which entail generating a positive response in the other person as a result of feeling understood, welcomed and accepted unconditionally. These three words—empathy, reciprocity, and unity—constitute a unified concept, defining what a relationship is like when it is satisfactory in a prosocial sense. The "me" empathises because I feel responsible for building a relationship with another person, not only to understand the person but also to welcome, value, listen, and if necessary, even empower the person (build the person's confidence in him or herself, his or her ideas and interests) whoever the person might be. We must invest more time not only toward understanding what people say and think but toward becoming interested in their interests (even if they are, or we perceive them to be, different from ours), and making the effort of trying to understand their perspective. Instead of taking advantage of their weaknesses, I become interested, I ask questions, giving others the opportunity to 43rganize their own thoughts, to describe what really bothers them, or to describe their genuine interests; so that they can restructure their ideas until they are clear even to them (if they were not already).

Am I indifferent to whether my listeners are upset or not when I speak to them? Do I convey interest with my facial expression when somebody speaks to me? Do I tend to give verbal and non-verbal signals such that the other feels that I understand fully? Do I commonly ask for feedback from others to gage how they perceive my empathy? Do I take it upon myself to know and understand the views of others? Do I assume the responsibility of empowering (providing emotional security, facilitating the organization of thoughts, asking questions to allow people to find their true interests) the person I am interacting with when the person expresses confusion or uncertainties that make it difficult for us to reach an agreement? Am I able to put myself in the shoes of my patients? Do I go to the effort of knowing and understanding their point of view? Do I give feedback paraphrasing what they have told me?

6. Do I strive to confirm the dignity of my listeners?

When we converse with somebody, speaking and listening are important behaviours, but equally important is making people feel and see that we take them seriously. Others should feel that I have confirmed their value as people, I know them, I appreciate their presence, and they are worth my interest, respect, and attention. Confirmation can occur through words, but mostly it happens through facial expressions, posture, gestures, or other signals.

When people inform me of positive news, do I smile as a way of welcoming this information? Do I make eye contact with them? Do I regularly ask questions to encourage them to speak, and to make them feel that I care about their words? Do I show my partner, friends, colleagues, and students, in any way, that I value their presence? Do I affirm my patients' value as people, calling them by name, asking personal questions, and welcoming their emotions whether positive or negative? Do I avoid undervaluing, passing off as obvious, or reducing the importance of what the patient tells or attempts to tell me?

7. Do I positively rate the people I am speaking to?

It has been shown that the best way to promote a new ability in another person is to believe and trust in his or her potential. This is true even for adults. By the same token, it is advisable for couples, work teams, or people we interact with on a daily basis—relationships with a higher probability of wear—to practice seeing the other person "with new eyes" every day. In other words, we should stop complaining or lamenting: why don't you act anymore like you did when we first met; why don't act how I want you to; if I were you I would do things differently; instead, we must acknowledge the achievements and efforts of others, however small, although they may be "camouflaged" by negative features. Of course, we must keep an appropriate balance: the point is not to shower others with praise every five minutes. This could be counterproductive, as easy praise might be interpreted as ironic and an attempt at self-assurance.

Do I identify and acknowledge the efforts and skills of other people? When I positively rate what another person tells me, does he or she notice? Do I positively rate the work of my colleagues even when other people are present? Do I express my admiration for clever colleagues even if they are not my friends? With my patients, at some moment during our encounter, do I positively rate any of their behaviours or words? Do I congratulate them on their effort or progress?

8. Do I listen with care?

Knowing how to listen is undoubtedly the most difficult aspect of communication. Listening involves great effort, as it requires understanding a message while avoiding distractions. And, the listener cannot control the course of the conversation, rather it is the speaker who manages talking time and pauses so that the other can speak. Of course, we all like speaking to somebody who knows how to listen: somebody who waits for me to finish my idea before talking, and who doesn't interrupt me midsentence. To develop this habit, people must begin by devoting themselves completely to listening to the speaker, remaining fully receptive until the speaker has finished.

When I listen to someone, do I make eye contact and directly face him or her? Or instead, do I go about my other business while the person speaks? Do I reaffirm what the person has said, verbally or with gestures? Do I strive, verbally and nonverbally, to make my patient know that I am listening attentively?

9. Quality emission.

We must be careful not only with what words we say, but how we say them. One inappropriate message can trigger a large problem. Quality emission entails, among other things, using a tone of voice and intensity appropriate for the listener. If the other feels that I am shouting, even though I believe I am speaking softly, this is likely to impact our conversation. For this, it is important to watch my assertiveness (do I say things at just the right moment?); my talking speed (when I am speaking fast, do I make sure the listener can follow along?), and of course, the same features that constitute quality listening; physical displays like eye contact, facing the speaker, making comments appropriate for the topic of conversation, etc.

Do I communicate information to my patient in the manner that is friendliest and clearest given his or her personality characteristics, culture, and age?

10. Accepting the negative.

Accepting the negative means not only being open to criticism, but also acknowledging everything that bothers me and interferes with my communication with the other person. Accepting the negative means accepting everything bothers me and acknowledging it; not hiding it, avoiding it to give it some kind of personal or internal meaning. According to Roche, "negative" is the absence of positive. As such, if we clearly observe a lack of positive in some aspect of the communication, this is our opportunity to improve it. Lack of understanding, for example, suggests the need to understand. Putting this skill into practice requires considerable effort and will, and applying of all the aforementioned abilities.

Am I able to accept features I consider negative in the other so that they don't interfere with our communication? Do I accept anything negative the other person sees in me without it interfering in our communication? Am I able to overcome my negative mood stemming from my own problems so that it does not interfere in my communication with others? Do I accept anything negative the patient might see in me as well as anything negative I might see in the patient?

11. Positive conflict resolution

Resolving conflicts positively entails, first and foremost, eliminating violence from conflict resolution, and accepting conflict as something normal that happens when diverse people share a common space. Conflict is not violence. Acknowledging conflicts also means managing each conflict according to its nature: the optimal way to resolve a difference of opinion concerning a factual problem (something that happened), where perhaps a few verbal statements would suffice, is different from how we would resolve differences of personal interests, especially when these differences appear to be incompatible (or truly are). Accordingly, a different solution would be required for value differences, for which a lifetime of debating may not be enough to convince the other person to change his or her view. And, for differences that involve a fundamental problem in the relationship between two people, no matter what words are said, the conflict will not be resolved until harmony in the relationship is achieved first.

When I have a conflict with a patient, family member, colleague, or boss; before discussing points of view or solutions, do I try first to identify the type of conflict, so that I can search for the most appropriate strategy to maintain communication? Do I put aside my own stereotypes and express to my adversary that I respect his or her dignity? Am I able to solicit the involvement of a third party, accepted by the adversary and me (a mediator, referee, judge), if I perceive that I, or the person I am in conflict with, is not prepared to establish a

dialogue that is respectful and free of verbal or nonverbal discrediting? Do I try to resolve conflicts in a manner that is constructive and enriching for the patient and my relationship with him or her?

12. Shared decision-making

Not all decisions necessarily involve conflict. Perhaps people more or less agree on a matter, but they find it difficult to make a decision. In shared decision-making, context does not occur passively or spontaneously, but rather it is designed and constructed, and we aim to create an appropriate and favourable space for the problem we want to solve. Interacting in a prosocial manner fosters making decisions as a group, valuing every idea, recognizing minority views, and including the whole group in the process. The challenge is to bring horizontality and participation into action, by actively using, as a group, all the factors of the model.

Before discussing a complex topic with a patient, family member, work team, or colleague, do I strive to set clear and agreed-upon rules of interaction: who will speak first, is it acceptable or not to interrupt, who gets the last word? Do I try to organize the communication exchange beforehand: establish which topics will be discussed and which will be left out? Do I place a priority on using, as soon as possible, methods that are inclusive, efficient, and appropriate for the context and the nature of the problem, in a manner that promotes shared decision-making? Do I share the decision-making process with the patient as much as possible, such that the patient feel included?

13. Information that is sufficient, pertinent, relevant, representative, frequent, and not excessive

A well-spoken word is worth more than a speech. This is true of all types of communication. With people with whom we share a common space, at work or in the family, we see this principle on a daily basis: saying things without going overboard; talking, but neither overly more nor overly less than what the other person expected. It is a difficult skill, but it can be learned.

Do I select the quantity and type of information that is most appropriate for each patient given his or her personal characteristics and present circumstances?

14. Openness to positive and negative emotions, and revealing them assertively

This is one of the most important aspects of quality communication, since more so than rational contents, emotional and sentimental factors are what make the communication more "personal", "private", and "exclusive". "Opening up" to a fellow person in a manner that is contextually appropriate allows him or her to know what I think, feel, or want. Of course, we should be selective in communicating positive and negative emotions in order for doing so to be truly beneficial (we should avoid displaying an indiscriminate, never-ending catharsis).

Do people know what I expect from them? Do I frequently communicate my positive emotions? Do I reveal my complaints carefully and at the right moment? Am I able to avoid spontaneous reproaches? Do I express my emotions (worries, doubts, joys) or expectations to my patients regarding the situation at hand?

15. Controlling communication

We must control communication, rather than the communication controlling us. We should maintain a set of rules appropriate for the needs and identity of all parties involved, so that the desired goals can be achieved each time important matters are discussed. Communication rules are especially useful for handling complicated topics on which people might disagree. On a different note, we each have our own way of viewing and understanding the world. The same word can mean different things to different people. Comparing meanings is a useful practice, especially for commonly misunderstood words. Thus, we should be able to:

Ask when we don't understand; ask if we have understood correctly; give advance warning of bad news so that the receiver can prepare adequately; or when faced with a contentious issue, asking ourselves, What did I understand? What did you mean? Does this word mean the same to both of us? Do I strive to make sure that my communication with a patient is completely efficient and satisfying? Do I ask my patients if they have understood my questions, or my indications? Do I make sure that my patients have understood a technical word I used?

16. Making clear, in a prosocial manner, the structural rules of the system, and the basic rules of conversation

Rules are "like cycles of interaction that repeat themselves" (Roche, 2006, p.149). Many times we don't notice rules exist until somebody breaks them. For instance, at home, if a visitor comes to eat and sits in the chair where the mother usually sits, nobody says anything, but the youngest child gets angry and asks the visitor to sit somewhere else, for the family rule is that that is mom's chair. Roche identified categories of rules of interaction: normative (rules that control aspects of individual behaviour, e.g., smoking is not permitted inside the hospital) and interaction (rules that control the communication or behaviour of two or more people during an interaction, e.g., in the waiting room of the head doctor, do not shout, speak softly). Within these rule categories, the author distinguished between those that are explicit (those we are conscious of and speak about openly), those that are made explicit (they were implicit until somebody in the interaction identified them and everybody accepted them), and those that are implicit (rules for which there is confusion regarding the norm, or rules that have not been agreed upon, but rather they stem from habits, from chance, or from the expectations of one or more people in the system). Going one step further, each of these rules may be neutral (rules that do not harm the social dynamic), or negative (they negatively impact some members of the group by preventing their actions). Expressing or speaking about our rules is a way to identify us as a system or a group. We should be able to control our own functioning and have the flexibility to change the rule structure whenever necessary. However, sometimes the accepted rules of an interaction aren't explicit, but rather are assumed. Making these rules explicit can be a complicated but very important step. The challenge that the PC model takes on is not the novelty of making rules explicit, but rather doing so in a prosocial manner. An example of an interaction rule that is implicit and negative would be "do not ask questions to X home care professional because home care professional X does not like to be interrupted". Undoubtedly, this rule impacts the trusting relationship with the patients, the atmosphere in the health clinic, and even the successful implementation of a treatment, since a patient who does not feel at liberty to express doubts might not carry out a treatment properly. We can say that this rule threatens the system and perhaps Home care professional X is unaware of it, or perhaps is aware but prefers not to talk about it. It would be unwise to accuse the Home-care professional or bring up the issue in a room full of patients. Making the rule explicit can be a harmful exercise if it is not done properly, in the right place, or at the right time. Making rules explicit means taking charge of a common learning process. For instance, what should a hospital unit do with a boss who never delegates, doesn't trust, and is never happy with what his team does? And especially, what should be done when the boss is convinced that he or she is horizontal, democratic, and inclusive? For such a boss, the implicit interaction rule is: people are free to talk, but I decide. The work team may assume

this to be the rule without saying anything: in this unit of this hospital, the boss decides, and that's how the system works…nobody complains, nobody takes initiative, people wait for the opinion of the boss, even if they are accused of not participating. It is an implicit rule that everybody accepts, apparently without problem. The problem for the system begins when one or more team members arrive who are not aware of the rule or do not accept it: they want to debate, opine, and make decisions. The unspoken rule creates conflict. Explaining the rule bluntly maybe even more harmful than maintaining the status quo. However, making the rules explicit in a prosocial manner could prevent problems. For instance, if in the appropriate environment, a person who the boss accepts and holds in high regard, asks the boss: How do you prefer to work? What is the most efficient method for you? Do prefer to always make the decisions yourself or do you like to decide with others? Because, I have the impression that the last word is always yours. Do you do this because you work faster this way? And the boss, in a peaceful environment, will think about it, reflect, and say…really, do I do that?? Or might say, it's true, I don't trust anybody but myself…from now on the rule will be official, and I will make it clear to the group: "Folks, I know I can appear authoritarian, and maybe I am, but look, I have a limit, nothing can occur in this unit unless I authorize it. I'm sorry if you don't like it, but unfortunately that's the way it is, so I hope we can get along and this doesn't cause any conflict." And the rest will say, boy, I don't like this, but rules are rules; others will say, okay, this is the rule, I will respect it but as soon as I get the chance, I am switching to a more democratic unit. This does not eliminate the authoritarian environment, but it helps keep the relationships healthy.

Do I try to explain openly and personally, without undervaluing or over protecting the patient, what the rules are that we must follow throughout treatment?

17. Cultivating a specific empathic aim

A communicative process, focused on the relationship and on others, cannot focus only on the past and present communicative exchange, but must also take charge of its future effects. In other words, once the communication exchange is finished, after a few days, weeks, or months with the person, ideally the communication stimulates empathy and maintains it, cultivating an empathic goal that permits continuing quality communication and making the others feel like "legitimate others" (Maturana, 1995), making them see that we remember

them, that we have not forgotten their issue, that we are working on their case, that we have taken them seriously, that we are interested in what we spoke about the previous visit. This should happen through some type of intentional communicative exchange or even a behavioural exchange (an action or a gesture) specifically designed to convey validation, acknowledgment, and esteem. For instance, a simple phone call to ask if the problem was solved could suffice. Or an email, or an interested question about the issue that the other person indicated was important.

Do I take the time to provide, at a minimum, specific feedback, over time, to my friends, family members, colleagues, students, parents, that shows my interest in the issues that affect them personally? When somebody has asked something of me, do I make an effort to, at a minimum, give a quality response regarding the possibility, or lack thereof, of meeting the person's wishes? Do I strive to stimulate the continuation of the empathy created with the other and strengthen the trusting relationship we have created, through some kind of prosocial actions once the communicative exchange has finalized? Do I try to make the patients feel that I remember them and am concerned with them? Do I show interest in what we talked about last time we met?

Identifying our strong and weak points. Everybody has strong points and weak points. Nobody communicates "well" or "poorly", but rather everybody has aspects he or she can strengthen, empower, or develop further, perhaps because of a lack of practice or not being aware of the aspect. The most important step in the identification process is being motivated to change, and having the ability to self-evaluate and persevere (because no change is automatic). Furthermore, if this identification process is done together with another person with whom we share high regard and trust, the results can be promising: the results of the self diagnostic test can be compared and commented on by both people, as we suggest in the following exercise (H). The following exercise enriches one's relationship with others, provides useful and perhaps new information concerning how others see us, and helps us to understand how we view ourselves in terms of how we interact with others. After the following exercise, we can also train PC with roleplaying exercises or group exercises, remembering that each exercise should have a corresponding meta-communicative analysis.

H. Practical self-diagnostic test. How do I rate the communicative style I use with my patients? The prosocial communication model adapted to the role of the socio sanitary home care professional. For the self-diagnosis we must work with Table 1.

For a refined analysis, it is useful to carry out this test with specific types of patients in mind. First, we can ask, how do I rate my communication with this particular patient? Later, we can ask more general questions: How do I rate my communication with my patients in general? With foreign patients who don't speak my language? With elderly patients? I examine every item in this fashion and give myself a score from 1-5.

Granted, this self-diagnostic test does not reflect facts, but rather my own subjective perceptions at a particular moment in my relationship with the patient. The same test performed at a later time could show a different result. The contribution of this test is to help me to visualize something as abstract as the strong and weak points of my communicative style.

This self-diagnostic test is the basis for designing a possible subsequent optimization program.

Self Questionnaire Prosocial Quality Communication Model (PQC)

	Factors, attitudes and behaviors	5. Always	4. Almost always	3. Some-times	2. Almost never	1. Never
Previous	**1. Openness and readiness as receiver.** Do I make myself available, and do I show this to my patients, both verbally and nonverbally?					
	2. Opportunity as initiator Before giving a diagnosis, suggesting a treatment, or providing information, do I					

	make sure that the emotional, spatial, and temporal circumstances for the patient and myself are appropriate?					
Process	**3. To empty oneself** Am I able to empty myself of my other thoughts and worries to give the patient 100% of my attention?					
	4. Live the present moment thoroughly When attending to a patient, do I concentrate fully on the present moment without distracting myself with thoughts of past or future events?					
	5. Empathy, reciprocity and unity Am I able to put myself in my patients´ shoes? Do I make an effort to know and understand their point of view? Do I give feedback paraphrasing what they have told me?					
	6. Confirmation of the other's dignity					

	Do I affirm my patients´ value as people, calling them by name, asking personal questions, and welcoming their emotions whether positive or negative? Do I avoid undervaluing what my patients say or attempt to say, passing it off as obvious, or reducing its importance?					
	7.Positive evaluation of the behaviours of the other Do I positively evaluate any aspect, comment, or behaviour of my patients, or congratulate their progress or efforts, at least at some moment during our interaction?					
	8. Quality Listening Do I make an effort both verbally and nonverbally, to make my patient feel that I am listening attentively?					
	9. Quality emission Do I communicate					

	information to my patients in the friendliest and clearest manner appropriate for their personality characteristics, culture, and age?					
	10. Acceptance of what is perceived as negative Do I accept anything negative that the patients might see in me, as well as anything negative I might see in them?					
	11. Conflict resolution from a positive perspective Do I try to resolve conflicts in a manner that is constructive and enriching both for the patients and for my relationship with them?					
	12. Shared decision taking For decisions that affect the patient, do I include them in the decision-making process as much as possible, making them feel like they play a part?					
Contents	**13. Appropriate,**					

	relevant, not excessive, representative and frequent information Do I choose the most appropriate amount and type of information for patients, based on their individual characteristics and present situation?					
	14. Openness to reveal emotions Do I express my emotions (worries, doubts, joys) to patients, or my expectations regarding the issues we face?					
Meta-communication	**15. Checking and controlling the communicative Process** Do I concern myself with checking that my communication with the patients is completely?					
	16. Making explicit the structural rules of the system in a prosocial way Do I try to explain openly and intimately the rules and protocol that must be followed					

	throughout treatment, without undervaluing or overprotecting the patient?					
After the communicative act	**17. Cultivate and carry out an empathic and concrete goal** Do I take it upon myself to make patients feel as though I remember them and am concerned with them? Do I show interest in what was discussed the previous time we met?					

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Prosocial Quality Communication Model (PQC)

Operational definitions

The aim of the Prosocial communication is not: - generate consensus - to convince - to persuade the other person of an idea, or opinion.

Instead, the aim of the Prosocial Communication is: to connect with the other person to understand from their point of view. Here you will find the Prosocial Communication model as a list with a lot of brief definitions of positive behaviours for every factor.
What is it used for? Once you have read the narrative definitions of each factor, maybe you might be interested to know how to optimize your weaknesses. Read the Factor that you want to optimize, read the positive behaviours that describe this factor. The objective is to increase these behaviours in quality and quantity and keep a written personal control of your emotions, thoughts and effects of that generates in your person and in your environment.

Factors / Attitudes and behaviours

PREVIOUS

1. Openness and readiness as receiver

1.1 The receiver is characterized by a general readiness to leave his/her activity in order to
attend the initiator of the conversation
1.2 The receiver tries to adapt her/his self to the space, the moment and the way chosen by the initiator to establish the interaction

2. Opportunity as initiator

The Initiator observes whether:
2.1 the state of mind of the Receiver is adequate to the content of the communication that he/she tries to initiate.
2.2 the proper state of mind is also appropriate.
2.3 the activity of the receiver in the moment of the interaction is compatible with the act of communication.
2.4 To choose an environmental context adapted to the communication act:
- Space and territory without interferences
- Noises or discomfort
- Schedule and suitable moment of the week
- To avoid the presence of third persons in case of complex topics

- Sufficient time to talk

2.5 The initiator creates a positive relational and environmental climate by:

- Questions that reveal the sincere interest in the other person

PROCESS

3. To empty oneself

3.1. Liberation of contents and emotions immediately previous to the current communication process.

4. Live the present moment thoroughly

4.1 Liberation of prejudices against the other person, originated by experiences or memories of the same person in other situations and moments.

4.2 Living the "here and now" of the communication: that means to center all the attention on the current relational reality. The allusions to contents of the past or the future must not mask the current relation, but, in any case, enrich it.

5. Empathy, reciprocity and unity

To give feedback characterized by:

5.1 the verbal expression to be perceiving the perspective of the other, to be understanding his/her conceptual representation of the world (cognitive empathy),

5.2 the verbal and non-verbal expression to be perceiving the emotions of the other (emotional empathy).

5.3 Use of verbal and non-verbal resources to show empathic attention. To be responsible for improving the quality of the relation, based on the comprehension, recognition , respect and esteem of the point of view of the other.

5.4 To ask the other for feedbacks to know how he/she perceives my empathy

5.5 To empower the other when his/her apparent confusion or doubt makes the intelligibility of the dialogue difficult

6. Confirmation of the other's dignity

6.1 To recognize the other as a person, and therefore, as somebody in possession of dignity.

6.2 To recognize the other as a source of communication, of information and deserving
attention and interest.

6.3 To know, to respect and to estimate the culture of the other

6.4 Use of questions as activating instrument of the interaction, and as a way to meta-communicate interest towards the other.

6.5 To apply gestures of openness like smiling, in order to show the positive welcoming of the other.
6.6 To use empowerment: recognizing explicitly and respecting his/her ideas (right to dissent), facilitating the expression of his/her opinion, and facilitate the structure of his/her ideas when these are not sufficiently articulated or clear to the others or for him/her self.

7. Positive evaluation of the behaviours of the other
7.1 Positive evaluation of the behaviours of the others. Praises.
7.2 Positive attribution with regard to capacities and possible or probable behaviours of the other.
7.3 Positive evaluation of contents and the process of communication

8. Quality Listening
8.1 Determination to adopt attitudes and behaviours of full listening, which begins with the will of "being the first one in listening"
8.2 External and behavioral declarations of the listening:
- Notable visual contact.
- Facial dynamic expression according to the tone and contents.
- A receptive position. Orientation of the body towards the other.
- Appropriate distance.
- Absence of anxious movements
- Verbal and non-verbal confirmations coherent with the content that is listened to.
- Control of the suitable interpersonal breaks.

9. Quality emission
9.1 Adaptation of tone and intensity of voice according to criterion of the receiver
9.2 Adaptation of speed.
9.3 External and behavioral declarations:
-Notable visual contact.
- Facial dynamic expression according to the tone and contents.
- A receptive position. Orientation of the body towards the other.
- Appropriate distance.
- Absence of anxious movements. Verbal and non-verbal confirmations coherent with the
content that is listened to.
- Control of the suitable interpersonal breaks.
9.4 Assertiveness. Expression of confidence and safety, facilitated by the listening to the other.

10. Acceptance of what is perceived as negative

10.1 Ability to accept features, attitudes, behaviors, contents of the other which are being
perceived as negative, so that they do not interfere in the current communication.
10.2 Acceptance of what the other perceives as negative in the actor. In this way, the actor it is capable of taking the proper responsibility, without interfering in the current communication.
10.3 Mental overcoming of the proper negative physical, psychic states, to encourage the positive relation with the other.

11. Conflict resolution from a positive perspective

11.1 To define if the type of conflict refers to a factual problem (something that happened), to a problem of confrontation of interests (our interests are, or are perceived as incompatible), differences of principles or a relational problem
11.2 To transmit human recognition of his/her dignity to the adversary, eliminating stereotypes
11.3 To request the possible participation of a third party accepted by the conflicting parties (mediator, arbitrator, judge), if they are not in conditions to begin a process of respectful dialogue and without verbal and non-verbal disqualifications.
11.4 To balance the communication by empowerment when the asymmetry makes dialogue, respect and reciprocal esteem, difficult.

12. Shared decision taking

12.1 To establish frames of common reference:
- what do we want to decide and why?
- what do we want to happen when the decision is taken
- Aim of the conversation

12.3 To frame the communication: to establish which topics will be dealt with and what topics
will stay out
12.4 To give preference to participating methods, efficient and adapted to the context.

CONTENTS

17.1 Stimulation of the continuity of:
- the created empathy,
- the recognition to the dignity of the other
- And strengthening of the relation of confidence constructed by prosocial actions of any type as soon as the communicative act is finished.

Note: This Material is an adaptation for DEEP of Escotorín, G.P. (2013). Prosocial Communication Inquiry in collaboration with gerontology health professionals. Consulta sobre comunicación prosocial con profesionales socio-sanitarios del ámbito gerontológico. Tesis doctoral, Universidad Autónoma de Barcelona. Bellaterra Escotorín, P., Roche, R. y Cirera, M. (2011). La prosocialidad y sus aplicaciones en salud. En P, Escotorín., y R, Roche. (Eds.) Cómo y por qué prosocializar la atención sanitaria: reflexiones, desafíos y propuestas. Conclusiones del Proyecto Europeo CHANGE (pp. 21-28) La Garriga: Martí L´Humà.

MODULE III: The Trans Theoretical model and the stages of change

In the DEEP project, the motivational approach makes it possible to focus on strengthening relational and psychological skills which constitute the common denominator of the skills of the different professionals involved in the project (health professionals and makers), crucial in working with the disabled person.

The Motivational Model (DiClemente and Prochaska, 1992), contemplated in our training course, represents an effective approach that can help create an appropriate relational climate between professionals and people with disabilities and thus promote the quality of work with them.

This approach learned during the training course will prove particularly useful when the professionals involved can implement it in the field in dealing with people with disabilities.
Health professionals who, during the course, will have learned the motivational model, will be able to motivate participants with disabilities to actively adhere to health care / rehabilitation treatments (treatment compliance), while the makers will motivate them to take part as co-designer to the laboratory activities planned after the pilot training.

As explained in the analysis of the needs of the indirect target of DEEP, the most recent studies show that up to a third of aids are not used today by the disabled (Scherer 2002, Federici and Borsci 2014). The use of 3D printing, which places the disabled at the centre of the production process of their aid, combined with the use of the motivational approach by professionals who in various ways will come into contact with people with disabilities, will favour indirect beneficiaries a cognitive, affective and attitudinal change.

Theoretical part

The use of the motivational approach helps professionals who deal with people with disabilities to fulfill specific tasks and their professional functions.
Such professionals should be able to deal with some negative habits of their clients with grace and determination, as well as increase adherence to the therapies and treatments prescribed. These and other motivational interventions have important effects on the maintenance of people's residual abilities, directly affecting the

quality of life. It is therefore a model in line with the bio-psycho-social approach currently in use (ICF 2001).

Helping people to change established habits and create others, more virtuous, is not an easy task at all and the professional encounters considerable resistance from the person, who despite being aware of his harmful behaviours ends up giving in to the need for an immediate gratification. The motivational approach is very useful due to its negotiating value, oriented to consider the point of view of the interlocutor; the relational dimension in the relationship with people with disabilities is the basis for establishing any change: this assumption, in addition to finding a confirmation in all types of relationships (friends, family, couples, work), is particularly true in the case of the helping relationship.

The helping relationship arises between two people who play different roles: one, in conditions of suffering, confusion or disability; the other in a state of adaptation, of greater skills and abilities, with respect to a given problem to be faced. Unlike relationships marked by addiction, which generate a variety of negative reactions, the helping relationship has the power to release mental and physical energies in both partners. This type of relationship has the power to awaken the necessary cognitive, emotional and affective resources that each of us possesses, putting them at the service of a possible change. Operationally, help consists in acting as a "mirror" towards the person you want to help by referring all the contents that appear in the relationship: from emotions, fantasies, and thoughts to ways of doing, gestures and attitudes. Reflecting oneself in another person favours the construction of a more realistic self-image, with one's expressed and unexpressed needs that can be more easily recognized and, therefore, satisfied.

In the helping relationship, the professional does not replace himself, but rather supports the other in the process of rediscovering his own potential. The objective of the helping relationship, therefore, is not limited only to rationally understanding the request or the underlying need; it is about adopting active listening that goes beyond verbal understanding of the content.

Active listening is the main tool of helping relationships. Listening is a voluntary act that implies the desire to pay attention to the conversation to understand what the interlocutor is expressing. Learning to listen actively allows you to communicate your presence in the relationship to the other, giving the clear feeling of welcoming and understanding. The salient feature of active listening is the unconditional acceptance of the other and the absence of a judgmental attitude which guarantee the interlocutor authenticity in expressing himself and the

freedom to be himself. In this we find the true cornerstones of a helping relationship.
In active listening the person communicates his willingness to accept the story as provided by the other; this willingness to listen is expressed by paying attention to the internal dimension of the person thus allowing to enter into empathic harmony with the other.

Empathy should not be understood in a reductive way as putting oneself in the other's shoes, but it means going towards the other, being with the other, putting one's way of perceiving reality and coming into contact with the mood, the perceptions and experiences of the other.
Expressing empathy does not mean identifying with the other, unconditionally expressing agreement or approval, but implies understanding his or her experiences, concerns and perspectives and being able to communicate that you understand.
This allows the other person to feel welcomed in that relationship, in a non-judgmental and relaxed atmosphere, favourable to the expression of one's own experiences (e.g. 'I think I can understand your worries and difficulties'; 'I understand that this may seem insurmountable to you, and perhaps it is, if we do not first understand where we can really intervene').

It is an innate impulse to intersubjectivity, i.e., a **relational motivation** that supports the child, from birth, to seek closeness and interaction with the reference figure, regardless of the satisfaction of a need for nourishment (Bowlby, 1969; Klein, 1959).
The assertion of the centrality of intersubjective experience implies the claim that entering into an individual's subjective experience, thus, the internal processes (experiences) of an individual, cannot be separated from the interactive experience; In this sense, it becomes impossible to separate the first ones (internal processes) from the second ones (interactive processes).

Therefore, the development of an individual can only be linked to a continuous exchange between self and the context of reference (people). **Purely physical care, without attention to intersubjectivity, may be insufficient to stimulate the resources of people with disabilities, whereas care supported by intersubjectivity is effective therapeutically and humanely, especially when people are ill and alone.**

The Transtheoretical Model (TTM) placed within the framework of intersubjectivity allows a better understanding of the person with disabilities with their cognitive and emotional processes and their motivational disposition to change.
The model focuses on the individual's decision-making process and is, therefore, a model of intentional change that uses a temporal dimension, because change

can only take place over time, with specific developmental stages of motivation to change. Therefore, there is no single attitude in a person regarding the possibility of change but various stages in which motivational levels and underlying psychological processes change and are activated according to motivation (Di Clemente 1997).
The motivational model is aimed at strengthening people's motivation to change their behaviour.

Specifically, in the DEEP project, the Transtheoretical Model (TTM) (DiClemente and Prochaska, 1992) will enable us to increase the motivation of people with disabilities to adopt healthy and active lifestyles, to consolidate treatment compliance, to increase their digital skills, and to stimulate their creativity, while increasing the efficiency and quality of their work, to acquire basic knowledge and skills with respect to the use of 3D printing, to participate in the design, production and realisation of aids, and to increase their sense of self-efficacy and active participation in laboratory activities (a step in which they will benefit personally from the DEEP model).

The Transtheoretical Model (TTM): the stages

Change is not an 'all or nothing' phenomenon but a gradual development process involving progress through specific stages, which follow a cyclical and progressive path. The stages of change are characterised by motivational levels that vary in intensity. An increase in the motivational level is a prerequisite for moving to the next stage and the individual time spent in each stage varies greatly, but the tasks to be performed to move to the next stage are more or less the same.
The stages are referred to as pre-contemplation, contemplation, determination, action, maintenance, relapse and exit. Since each stage requires the achievement of certain tasks in order to be overcome, it follows that particular change processes (behavioural strategies) assume different importance within a specific stage of change. For example, in order to move from the stage of pre-contemplation to that of contemplation, the person must become aware of the problem, addressing, for example, how to break habitual behavioural patterns and begin to consider some of their negative aspects.

Pre-contemplation: the person does not know or does not want to recognise the problem. At this stage, he/she has not yet considered changing his/her behaviour, perhaps because he/she is not informed or is misinformed about the dysfunctional behaviour he/she is engaging in. He may have made some attempts in the past

and now be demoralised because he/she has not been able to implement the change. So, the person is unmotivated or resistant to change.

Contemplation: the person knows he or she has a problem but has not yet decided that he or she wants to make an effort to change. At this stage he/she is considering changing his/her behaviour.
To move from the pre-contemplation to the contemplation stage, a concern must emerge in the person that is sufficient to put him or her in a position to begin to assess his or her dysfunctional behaviour. In this phase, the subject is aware of the pros and cons of the change, and this can lead to a situation of strong ambivalence that can cause him/her to remain in this phase for long periods of time.

Determination: the person recognises that he/she has a problem, has decided that he/she wants to try to change and is planning what to do. At this stage, the person may have planned to consult an expert, join specific treatment programmes for his or her problem (e.g., a diet programme for weight control or a psychological course to stop smoking). If the transition to this stage occurs as a result of a 'strong' decision made at the end of the contemplation phase, there is less risk of rethinking during the subsequent action phase.

Action: the person undertakes a series of behaviours that reduce or eliminate their dysfunctional behaviour. Action is not always a direct modification of behaviour, but all that set of activities that are implemented in an effort to modify behaviour. Action produces change if it in any way reduces the risk of disease. Therefore, if the change behaviour put into action is not incisive, the action phase is short-lived, and we return to the contemplation phase. Failures, unsuccessful attempts, unsuccessful actions, must be considered by the supervising professional, and reworked and returned to the person as opportunities for further learning, not as an absolute relapse or evidence of defeat.

Maintenance: after the initial actions, the person is continuing to maintain behaviours that reduce or eliminate their dysfunctional behaviour.
In this phase the person is committed to the stabilisation of change. Clearly in this phase the actions are reduced, the subject is not actively engaged as in the action phase, but in consolidating the positive action. This phase has an extremely variable duration depending on the behaviour and individual characteristics of the person. This phase can be considered settled when the new behaviour has been maintained for at least six months.

Relapse: the person has relapsed into the dysfunctional behaviour he or she wanted to be free of. This phase is an integral part of the change process. Only a minority of people engaged in a change process succeed at the first attempt. All the others find they must go through these stages several times.

Definitive way out: the last stage is included only in some versions of the Transtheoretical Model (TTM). The new behaviour is seen as being fully implemented with no fear of relapse, no temptation and 100% effectiveness. Total exit cannot be achieved, for some problems where control of the stimulus must be maintained over
time for the change achieved to persist (e.g., for a diabetic it is not possible to stop controlling his diet and monitoring his blood sugar).

Fig.1 Stages of change

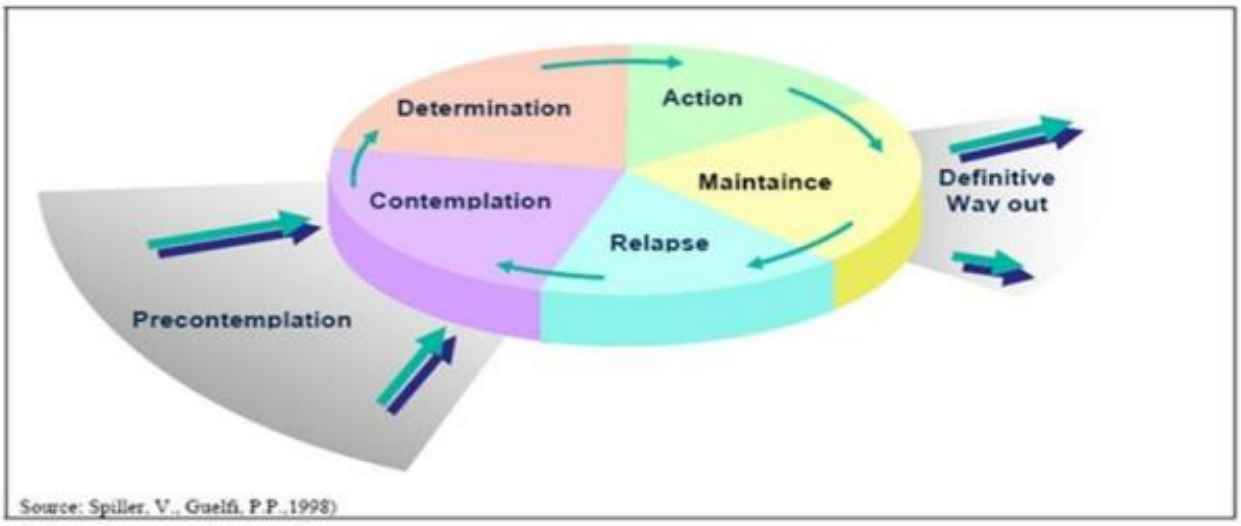
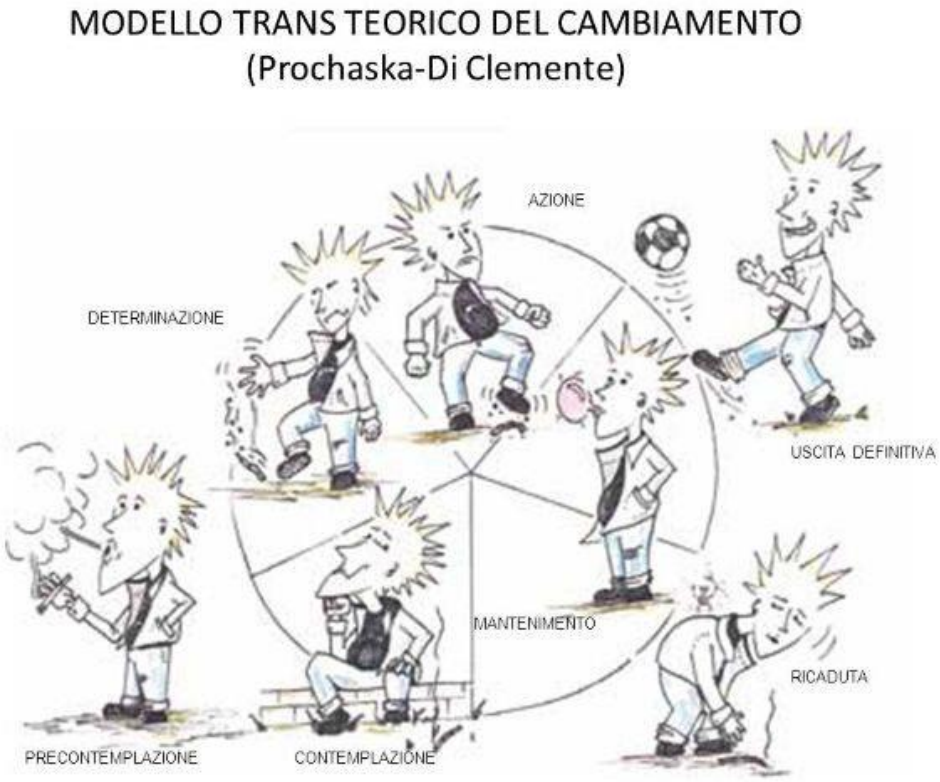


Fig. 2 Stages of change: iconic representation



Change processes are the mechanisms that each person puts in place to progress from one stage to another and consist of changing the way he or she thinks, feels and acts regarding an inappropriate behaviour. Of these processes, five are cognitive experiential and five are behavioural.

Cognitive experiential processes

- **Raising awareness:** raising awareness of the problem to be faced and the advantages of making a change. Techniques that can help the person are providing useful information on the topic, exploring with questions whether the person really is seeking dialogue for a change.

- **Emotional activation:** testing and analysing the person's emotional reactions to information about the problem and in general about the possible change

(e.g. for a person who has to stop smoking, informing them about the risks of smoking for his/her health). Techniques that can help emotional activation are participation in role playing exercises, psychodrama sessions or simulations through which one can experience oneself on an emotional level. Listening to testimonies of people who have already experienced the path of change can also be important.

- **Self-assessment:** this process considers which personal values can accompany the change, how the person feels about the problem and what perception he or she has of the possibility to change (e.g., 'I feel able to stop smoking ...', 'I feel disgusted at the idea of having weight problems ...', etc.). This personal evaluation covers both the cognitive and affective domains in relation to a specific behaviour. Useful techniques to facilitate this process are clarification and exploitation of individual values. Analysing the value assumed by meaningful people in the subject's life (e.g., seeing a person whom one esteems highly and would like to be similar can induce one to stop smoking) and imaginative techniques that facilitate personal evaluation (e.g. 'try to imagine what your life would be like as a non-smoker ...'). It should be emphasised that self-evaluation is most active in the contemplation stage, because at this stage the person begins to be aware of the behaviour to be changed.

- **Environmental re-evaluation:** recognising and evaluating the effects of change on the environment and on people around you. Techniques useful for fostering the effects of change on the environment are those that allow the subject to facilitate the explication of his or her values in the context of reference, highlighting any discrepancies and analysing how the change might modify the subject's relations with his or her environment (e.g. for a person with an eating disorder, you might ask questions such as "what would your children or friends think of you if you started eating healthier?").

- **Social liberation:** analysing and increasing all opportunities where social norms that can support change can be expressed. Useful techniques could be to participate in public speaking engagements, to encourage the subject to adhere to social rather than individual choices in order to promote community spirit. For example, in participating in social situations conducive to change, for a person who must quit smoking, it would be appropriate for them to participate in situations where there is a prohibition of smoking; or for someone who starts physical activity to participate in social events related
to sport, etc.

Behavioural processes

- **Self-liberation:** accepting responsibility and engaging in behaviour change through communication to self and others. Useful techniques can be public statements of one's intent and commitment to change, such as in self-help groups, or with significant people in one's life.

- **Stimulus control:** avoid stimuli that initiate or encourage the behaviour to be modified. Techniques that promote stimulus control are to avoid critical places and situations that trigger the behaviour to be modified (e.g., for the person who needs to stop smoking, it would be appropriate to avoid drinking a lot of coffee to avoid the coffee-cigarette association). Techniques that promote environmental control: e.g., removing from the home anything that may remind one of the stimuli to be controlled (cigarettes for those who need to stop smoking, or ill-advised foods for those who need to lose weight).

- **Counter-conditioning:** replacing the behaviours to be changed with "new" behaviours and activities that compete with the "old" ones (e.g., "after coffee instead of a cigarette I go for a walk"). Techniques that may be useful are to use relaxation to learn to manage one's emotions, to better manage anxiety, the use of nicotine substitutes for those who need to quit smoking, or low-calorie foods for those who need to reduce weight.

- **Reinforcement management:** reward yourself with positive reinforcement after implementing the new healthy behaviours. The gratification techniques that can be put in place are, for example, planning a series of enjoyable activities to be done at the end of each day when I have eaten healthily, at the end of each week, etc. Clearly, the planning of reinforcement is very individual in that choosing a reinforcer that is not meaningful to a subject risks undoing the result of the change action.

- **Helping relationships:** knowing how to seek and receive support from others to change behaviour. The techniques required are that of knowing how to accept help offered by others to implement and maintain change. For example, asking family members to change the family's eating habits to facilitate the change of the person with weight problems.

Psychological Factors

There are two psychological factors that contribute to change and determine the transition from one motivational stage to the next.
The concept of **self-efficacy** (Bandura 1977, 1991, 1995): describes a person's sense of trust in his or her own ability to organize and carry out the actions necessary to achieve set results. Self-efficacy, in fact, puts an individual in a position to consider changing his or her behaviour and maintain high motivation for the change that may have been initiated and for its maintenance. An increased level of self-efficacy is necessary because it supports the person's commitment to change and its maintenance. The mechanism of self-regulation provides continuous feedback to the person on his or her level of motivation and behaviour. Supporting self-efficacy in the person affirms an expectation of success in one's interlocutor that prompts the person to decide to change. It is a tricky operation because, at the same time, one should not minimize the effort that a change requires, nor hide the difficulties that one may encounter *(e.g., "What was another time in your life when you were able to make a similar change? How did you do it?", "What do you think might be the factors that supported you at that moment? Do you think you could be successful again now? What has changed?")*.

Locus of Control (Rotter 1966): an individual's tendency to perceive situations as contingent on his or her own behaviour (internal Locus of Control) or instead driven by external forces, such as fate or the actions of other people (external Locus of Control). In the area of health, a person with Internal Locus of Control believes that his or her health is dependent on his or her own preventive and health behaviours and thus he or she will feel directly responsible, whereas the person with External Locus of Control believes that health is dependent on fate ("if something is going to happen, it will happen regardless of what I do") or significant others ("if I trust a good doctor he or she will certainly save me") and thus will be less inclined to actively take care of his or her own health.

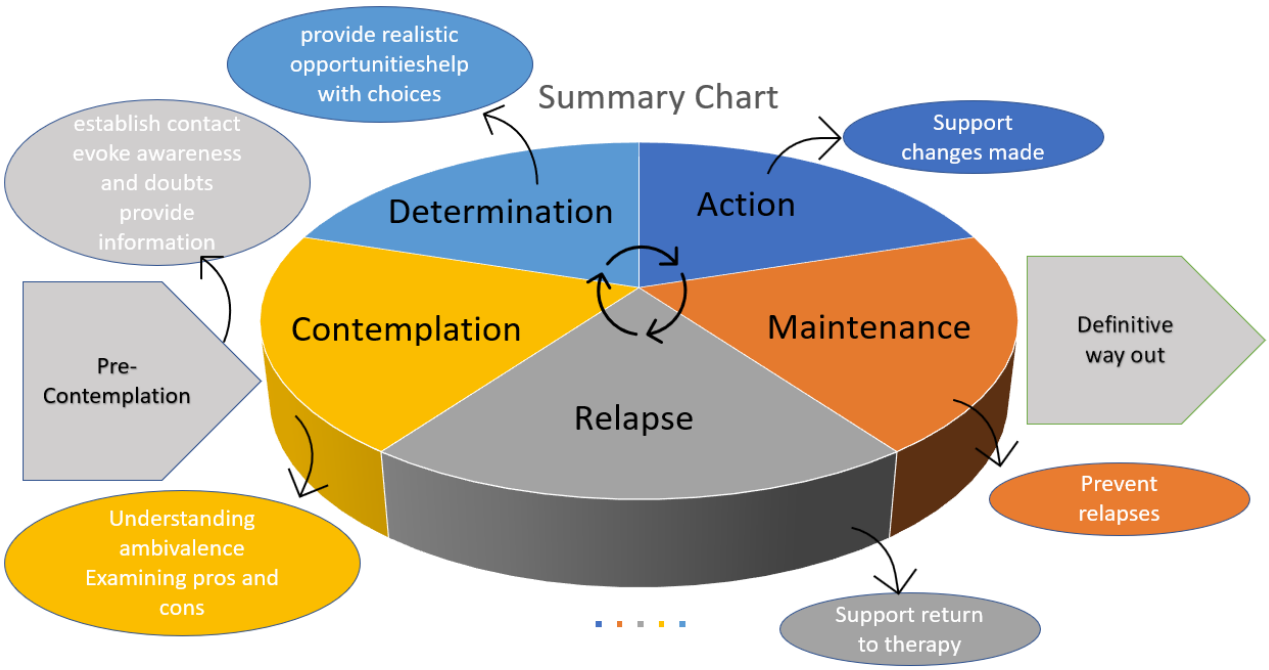
The **decision balance** (Janis and Mann 1977) is a change technique and not a psychological factor, although it is often referred to as such in scientific publications on the Transtheoretical Model because the evaluation of individual pros and cons is related to subjective psychological factors. It consists of the comparative evaluation of the positive and negative aspects of a particular behaviour. For example, for each behaviour studied, to move from the precontemplation stage to the action stage, the pros of change should overcome the cons in a 2:1 ratio.

Summary table

STAGE	PRE-CONTEMPLATION The person has not yet contemplated the idea of change, or does not want to, or does not feel capable of it	CONTEMPLATION The person admits to being worried and regards the possibility of change, but is ambivalent and uncertain	DETERMINATION The person is committed and planning to enact change in the near future, but is still considering what to do concretely	ACTION The person is actively making steps toward change, but has not yet reached a state of stability	MAINTENANCE The person achieved the initial goal and is still actively working to maintain the acquisitions
Readiness for change (RC) **Balance Decisional (BD)** **Self-efficacy (SE)**	RC absent BD absent "I am not unhappy or worried." SE absent	RC low/absent BD begins to increase/doubt "one way...the other way" SE low "...I can't do it, it's too difficult, hard..."	RC Increased but insufficient BD highest "I am very worried" SE low "although it is difficult, I have to find the way of how to do it."	RC very high BD high with swings "I'm already doing something, but sometimes I can't, then I feel bad..." SE low with swings "I know I can still give in but I think I can change"	RC absent for the change achieved BD absent "I am satisfied with the results" SE high "I can even when I don't feel like it"
Intervention goals	Increase awareness and doubt Providing information Maintaining contact	Understand ambivalence Examine the pros and cons	Providing feasible opportunities Help to determine choices	Support the changes made	Strengthening the changes Preventing relapse
Potential interventions	- Do you think changing your habits might make you feel better? - Have you ever thought that your condition might improve if .....? - I understand that	-It seems to me that you have a desire to change but something is stopping you ... - Of his/her behaviour what are the negative and what are the	- Now that you are sure that a change is important, how do you think you can implement it? - From 0 to 10 how much would you like	- You have made a difficult but right choice; how do you feel? - How does the new	- Have you noticed that going back to the old styles of behaviour makes you feel worse?

	you do not want to deal with this issue....but it is important to your situation. - Do you know that (provide informational material)	positive aspects?	to change your lifestyle? - What are the next steps you would like to take? - How much and what help would you like?	lifestyle you are adopting make you feel?	

- **Fig. 3** Summary graph



Model strengths

- Needs analysis: applicability in the analysis of undesirable behaviours (e.g., unhealthy eating);
- can help us understand "how" to prevent them, because the motivational mechanisms underlying behaviour change and prevention are the same;

- allows the intervention to be calibrated individually and by subgroups of beneficiaries according to their stage of change;
- can be adapted to the age of the beneficiaries (adolescent adults, leaves some perplexity in developmental age application);
- allows self-assessment that facilitates awareness and consciousness raising;
- puts the person at the centre makes choices (locus of control) and is not based on the prescriptions of health professionals;
- works on individual availability for change. Clearly, however, this readiness on the individual level must be integrated with structural and social change in living and working environments (actions on the enabling and reinforcing factors that can make the environment more conducive to health).
- helps answer the question *"am I going in the right direction?"* and gives the opportunity to readjust the "shot" during the progress of the intervention.

Critical aspects of the model

- the possibility of calibrating the intervention for subgroups according to their stage of change faces the practical difficulty in diversifying the interventions in the subgroups themselves (e.g., how to correctly choose/apply the training strategy in the subgroup during the contemplation phase to promote the transition to the action phase?);
- model is often used very accurately in the subject assessment phase and less carefully in the effective intervention phase. This aspect has also been emphasized in the international literature and could be due to weaknesses in the description of the operational aspects of the intervention carried out or to an actual greater accuracy of the model itself at the stage of description of the subjects' situation than at the stage of its concrete applicability. Often the time devoted to the intervention (one and a half hours for each homogeneous group), based on motivational techniques, also seems too little, especially in relation to the time devoted to questionnaire administration and data analysis;
- useful to use for health promotion as long as it is applied critically, with an accurate description of the types of interventions used, and with an overview of the context in which the intervention itself is set; used in this way will allow generalization of results and foster dialogue between different professionals working on health promotion.

Practical Part

EXERCISE 1

The observation protocol is specifically constructed to evaluate the ability of professionals to use correctly the Transtheoretical Model (TTM) developed by DiClemente and Prochaska and Motivational Approach.

The protocol consists of four schedules for each motivational stage (precontemplation, contemplation, determination and action). The items refer to:

- the behavioral indicators suitable for raising the patient's motivation in relation to the motivational stage he or she is at;
- the behavioral indicators inappropriate tending to generate a closed reaction on the part of the patient.

The observation can be carried out by the expert-evaluator in real and simulated situations.

Some items focus the evaluator's attention on the communication strategies considered, such as active listening or the ability to ask lifestyle questions.

The first exercise is related to the Transtheoretical Model (TTM) DiClemente and Prochaska, (1992). Instructions and sheets to be used are given below.

INSTRUCTIONS

To identify the patient's prevailing motivational stage (pre-contemplation, contemplation, determination, action) and for each item mark the most appropriate score according to the presented legend.
In order to make this exercise even more experiential and participative, the trainer may ask participants to simulate "typical situations" professional-disabled using the methodology of role playing.
This should be done for each stage and before filling in the evaluation grid.

1= never
2= rarely
3= sometimes
4= often
5= always

Observation protocol of the motivational skills referred to different motivational stages						
Simulation of the **pre-contemplation** stage of person with disability. The following behaviors can be observed in the professional.						
		1= never	2= rarely	3= sometimes	4= often	5= always
1	The professional maintains a helpful behaviour even after a rejection					
2	The professional resumes and rephrases what the patient says showing good ability of active listening					
3	The professional avoids the insistence and / or repeated attempts to convince					
4	The professional asks questions to arouse doubts about the opportunity to change					
5	The professional maintains a positive contact with the patient					
6	The professional calmly accept the patient's					

	rejection and maintains a positive contact					
7	The professional warns about the negative consequences of unhealthy behaviour to induce worry					
8	The professional provokes defensiveness and / or irritation of the patient					
9	The professional shows irritation in front of the patient's rejection					

Observation protocol of the motivational skills referred to different motivational stages						
Simulation of the **contemplation** stage of person with disability. The following behaviors can be observed in the professional.						
		1= never	2= rarely	3= sometimes	4= often	5= always
1	The professional maintains a helpful behaviour in the face of the patient's rejection					
2	The professional helps the patient to explore the pros and cons of healthy behavior					
3	The professional helps the patient to explore the pros and cons of uhhealthy behavior					
4	The professional maintains good contact with the patient					
5	The professional avoids insistence and/or repeated efforts at persuasion					
6	The professional gives recommendations on how to behave without					

	checking the patient's receptiveness					
7	The professional reproaches and warns about the negative consequences of unhealthy behaviour to induce worry					
8	The professional provokes a defensive and/or irritated behaviour by the patient					
9	The professional shows irritation in front of the patient's rejection					

Observation protocol of the motivational skills referred to different motivational stages						
Simulation of the **determination** stage of person with disability. The following behaviors can be observed in the professional.						
		1= never	2= rarely	3= sometimes	4= often	5= always
1	The professional raises questions stimulating the patient to explore opportunities to practice healthy behavior					
2	The professional redefines the statements of the patient to facilitate reflection and choice					
3	The professional asks questions to explore the positive effects of a helpful behaviour					
4	The professional asks questions to explore the level of desire to change					
5	The professional asks questions to explore various opportunities to stimulate healthy					

	behavioral					
6	The professional asks questions to help the patient set realistic goals					
7	In the attempt helping, the professional tends to substitute for the patient in the choice					
8	The professional gives recommendations on how to behave without checking the patient's receptiveness					

Observation protocol of the motivational skills referred to different motivational stages						
Simulation of the **action** stage of person with disability. The following behaviors can be observed in the professional.						
		1= never	2= rarely	3= sometimes	4= often	5= always
1	The professional reinforces the changes with positive affirmations					
2	The professional concretely analyses the effects of change					
3	The professional asks about the risks of having a relapse into previous habits					
4	The professional asks questions about the positive consequences of healthy behaviour					
5	The professional asks questions on what to do to maintain healthy behaviour					

EXERCISE 2

This exercise can be used in conducting the intervention with people who are in the motivational stage "Contemplation": They are not ready to change their behaviour, but they are evaluating the advantages and disadvantages of change (people have accepted the dedicated intervention after the first evaluation).
Below you can find statements that the professional can use to motivate the person to change.

1. It is positive that you have expressed an interest in deepening this behaviour (refer to the person's condition to be improved) ... it means that your health (health understood as physical, psychological and social well-being) is close to your heart.
2. In particular, why would you be interested in talking about this?
3. These seem to be very good reasons. So, you would like to change, but you don't feel ready to do so yet. Let's try to better understand why.

The professional asks the person to fill out this grid: the ***Decision Balance***.

REASONS FOR MAINTAINING THE STATUS QUO 1) 2) 3) OTHERS...?	REASONS TO CHANGE 1) 2) 3) OTHES...?
DISADVANTAGES OF MAINTAINING THE STATUS QUO 1) 2) 3) OTHERS...?	DISADVANTAGES TO CHANGE 1) 2) 3) OTHERS...?

"What he compiled is a tool to assess his readiness for change. How would you comment on what you have written?"

- If the person has valid reasons to change (is sufficiently motivated), the professional asks to agree on an initial goal for change.

- If the reasons for non-change or the disadvantages of change prevail, the professional presents the grid again for further reflection: 'This is probably not the right time for you yet. Think about it carefully, because the reasons for change are well in your mind, as you can see in the grid. When you feel more ready, you can discuss this with me or with your general doctor. In the meantime, you also try to consider how you can increase his self-efficacy. For example... is it easier for you to think about changing his behaviour in the family, at work or in his free time...? Could someone or something help you? Is there another behaviour that you could change in a health-promoting way that you think would be easier for you to achieve? Very well... look carefully at your balance and review the brochure. Do not hesitate to contact me or your doctor if you change your idea.

EXERCISE 3
The Motivational Rule

The ruler is a tool to help people quickly express themselves and become aware of their positions on the issues at hand. First, the person answers a question using a scale of numerical values. Then the practitioner investigates the reasons behind the answer and asks the user why the person chose a specific numerical value, rather than a lower one.

"(If the person has decided to change) On a scale of 1 to 10, how confident are you that you will actually succeed, if 1 corresponds to 'no confidence' and 10 to 'extremely confident'?".
" What induced you to choose 6, rather than 3?". The question activates a moderate level of discrepancy (more would probably be irritating), to convey a request for statements directed towards change.

" What would it take to go from 6 to 7, or to 8?" The step-by-step approach to the question makes it possible to identify small steps that are easier to manage.

	0	1	2	3	4	5	6	7	8	9	10
How do you feel disposed and ready to introduce changes in the ... (*specify the condition to be improved*)?											
	Not at all much			A little		Rather			Much		Very
How much does your current way of ... (*add dysfunctional health situation that should be changed*) disturb you?											
	Not at all much			A little		Rather			Much		Very
How confident do you feel that you will be able to change your way of ... (*add the dysfunctional health situation that you should change*)?											
	Not at all much			A little		Rather			Much		Very

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MODULE IV: The benefits of technology in the world of disability

Introduction

In the DEEP project, the scope is to train health professionals and makers in co-designing and 3D printing technical aids with the involvement of the target end users. That shall allow to better serve some unmet needs from disabled people and support them in having access to a broader range of activities with greater participation. In this context, this module is aimed at reviewing the offer and demand in terms of customised technical aids and pinpoint the possibilities for co-design and production of new aids with the support of makers, considering the technical and economic aspects, as well as the needs that can actually be addressed and the stakeholders that could possibly be involved in the target ecosystems.

Theoretical part

The need for assistive technologies

Assistive technologies are defined in a very broad way as "any product (including devices, equipment, instruments and software), especially produced or generally available, used by or for persons with disability: for participation; to protect, support, train, measure or substitute for body functions/structures and activities; or to prevent impairments, activity limitations or participation restrictions" (International standard ISO 9999:2011, 2015).

The range of products that can be produced in the DEEP project is therefore theoretically very broad. Many different types of technologies can be considered (hardware only or e.g., hardware with embedded electronics; production of a complete aid or add-ons to an existing one). Moreover, the community of professionals and makers has the possibility to design more or less customised aids, for different communities of end users and very different purposes.

The first thing to consider to prioritise the needs is what is already available on the market, knowing that the commercial offer is growing, especially in the areas of mobility assistance (with a compound annual growth rate of +6.5% over the next 7

years) and adapted furniture (+6.2%) (Global Disabled and Elderly Assistive Technology Industry, 2020).
In spite of this growing commercial offer, a strong need for customised aids exists, which results from the diversity of conditions. It appears when taking into consideration the actual abilities of the target end users that a "one size fits all" approach isn't appropriate. From that point of view, it's important to question some of the assumptions and representations of disability that most people will share, especially if not familiar with a specific impairment:

- Only a very small minority of visually impaired people can actually read braille (less than 1%). Therefore, if braille-based aids can be considered in DEEP, it's important to note that visually impaired people are sometimes just typically looking for adapted visuals (in terms of contrasts, colors, large print...). Moreover, blind people tend to look first for sound-based aids to be assisted in their daily activities.

- The same way, only 5% of hearing-impaired people practice sign language. Their ability to get, but also emit and interpret sounds is very diverse, resulting on a different set of accessibility and communication needs, which makes standard technical aids more or less useful and adapted to their specific needs.

- 19% of the people with motor disability actually need a wheelchair but the impairment typically (also) affects the arms and/or the rest of the body. Beyond mobility, there is a need for aids to perform a huge variety of more or less precise movements and be able to use common equipment and an interest and need for technical aids that will facilitate such movements (prehension being especially challenging).

- Last but not least, there is a need for exploring the field of technical aids for people with a mental impairment as the support technologies could bring to people with such conditions is still not well very known. The forms of mental disability are so varied that it is sometimes difficult to define the needs. However, support in terms of mobilising the capacities of the people to concentrate as well as assistance to be able to better manage their emotional state can be very useful, using e.g., interactive devices and making use of colors, symbols and pictograms to catch and focus the attention of the target end users.

It is estimated that 40% of the disabled people are still facing challenges for getting some of their most basic needs adequately met, such as self-care,

hygiene, getting dressed, cooking a meal and/or eating, getting out, working, and being part of a social community outside of their home.

That part of the needs is to be taken into consideration but also the many psychological needs and goals that are even less fulfilled. The physiological needs are only the bottom of the pyramid of needs created by the psychologist Abraham Maslow. Based on his observations, he identified five categories of needs essential to the full development of any human being: physiological needs, the need for security, the need to belong, the need for esteem and the need for fulfilment (Maslow, 1954).

DEEP is committed to support a more holistic approach to disability, taking into consideration not only the practical needs of the target communities of users but also and possibly mainly what can support their integration into society in a more autonomous way, preventing all kinds of social marginalization and improving their psychological well-being.

To achieve that goal, it is important to consider assistive technologies that may support the following personal objectives and desires among the communities of end users: playing games, having fun, practicing hobbies (e.g. arts, music…), sports, participating to social life, performing activities with their family and friends, fulfilling their ambitions in terms of skills, studies, work…

The change of paradigm we are willing to support in DEEP induces to take into consideration the entire range of unmet needs faced by the disabled people we intend to work with. Moreover, the following further existing challenges should be identified and addressed:

- Technical aids that are available but from limited production and distribution channels
- Existing aids that are not satisfying because they are bulky or too expensive (Global Disabled and Elderly Assistive Technology Industry, 2020)

Finally, it is important to stress the need for assistive technologies and products that are easy to use, comfortable and aesthetically pleasing, those criteria being considered decisive in the motivation of the target end users to use a technical aid, irrespective of the complexity and novelty of the technology involved (Moody, 2021).

Assistive technologies are broad; how to decide for the specific aids to be co-designed in DEEP?

After reviewing the needs, the topic of this module is to assist the professionals and makers in identifying which aids could be co-designed and co-developed, keeping

in mind that as already indicated, the scope is to find more sustainable, inclusive and participatory solutions within an empathetic and motivational environment that is oriented to the development of autonomy, social inclusion and prevention of forms of marginalization, bringing together different professional categories and involving the views of the target end users.

The methodology to make a choice for specific solutions will be based on the following criteria:

the technical feasibility of the aids: our approach shall be based on what can actually be made with 3D printing and other machines available at local Fab Labs (e.g. 3D scanners, laser cutting…), and some designs we can easily self create or have an easy access to. Open source and open innovation models that can be worked upon and adapted are worth to be considered, all the more so as they are in line with the participatory and community approach that is being used in DEEP. The makers in DEEP shall assist the health and social professionals in having access to such models. That's why the diversity of profiles is very important in the trainings.

Beyond a sound co-design approach, the technical feasibility is related to the availability of the materials needed, which have to be affordable enough for the aid to be realistically produced by the community of trainees.

From the point of view of costs, it is important to consider the entire lifecycle of the product (will it have to be further adapted, maintained or replaced after a while ?) and the cost/impact ratio we can consider to achieve, the ease of production, replicability and level of customisation required for each device being worth to be assessed.

The replicability and potential impact has something to do with the size of the "market" and brings us to the second criteria for deciding on the assistive technologies to be considered in DEEP, that is to say the ecosystem we can realistically target and involve.

The economic aspects: beyond the local needs, which is the main factor to take into consideration as far as the demand is concerned, some further criteria may guide the type of assistive technologies that should be co-designed by a given community of stakeholders. The more the aids are supportive of the mission and vision of the professionals involved and the more the necessary partnerships are already in place, the easier it will be to integrate the co-design and co-development of aids in the daily activities of the trainees in a sustainable and meaningful way and for the mid to long term. It is therefore important for each community of trainees to review the partners they can call upon at regional, national or international level, to leverage their own potential and enlarge the scope.

The criteria to take into consideration are therefore related to:

- the potential end users: how many do the trainees have access to ? what is their biggest pain ? How many share similar needs ?
- the adoption factors: how easy will it be for them to get the aid ? how many would be interested to use it ? what is the added value of the aid ?
- the multiplying effect: how easy and likely is it that further people will be aware of and interested in what has already been done for one end user ?
- the organisational aspects: what is the trainees' situation in terms of human resources, skills, availability of the people in their organisation, what are the established links and routine they have with the target end users ?
- the alternatives: are there other solutions addressing the need ? How satisfying are they ?
- the service-side: is it easy to deliver the solution to the people? are there adequate distribution channels ? how many resources have to be mobilised to deliver? For how long will the product be useful ? could the end users use the aid in a fully autonomous way ? Would they need to be trained ?
- the environment: which partners are available for the design and production of the aid ? What is the position of the trainees in the target ecosystem ? How easy is the relationship with complementary stakeholders ?
- the level of control: how much can the trainees directly influence and foster the adoption of a given aid?

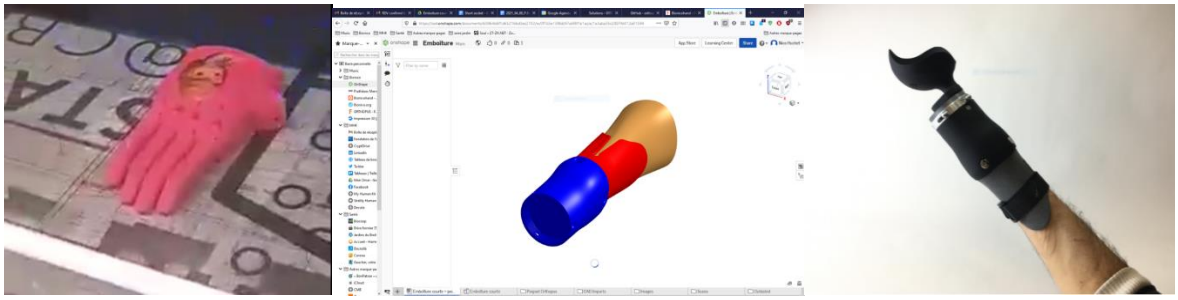
Those technical and economic aspects shall be discussed and analysed in the practical part of the training module, based on a feasibility-oriented evaluation process and methodology.

The different approaches:

Two different approaches can be considered in DEEP:

- the design of a new aid that isn't available
- the adaption of an existing tool for a better fit

Orthoses can thus be 3D printed from scratch based on a scan of the body of the target end user but also 3D printed to be customised in terms of materials and colour.



The first approach is relevant in terms of comfort and functionality while the second option increases the motivation and alleviate the stigma (a very important factor when dealing with children). Both approaches can be combined.

The choice of a given approach is very much related to the stakeholders to be involved.

Those are health professionals, social professionals and makers in DEEP but the group can possibly be enlarged to some technology providers. That may allow to create
some aids based on a **combination of assistive technologies** with a 3D printed part to be used with something else.

Depending on the complexity of the aid that is being considered, different communities of stakeholders can be called upon, including designers, entrepreneurs, researchers, students in e.g. electronics or engineering that can

play a key role in the design and production of the aids aside the health practitioners and makers and be part of the community of trainees.

The legal constraints:

In spite of our holistic approach that goes well beyond the medical needs of the target end users, some assistive technologies are very close to be medical devices and can be considered as such from a legal point of view. To avoid the trap of the certification of the aid, which is a complex and expensive process, the technologies to be designed have to be either a mere object not directly embedded to the body of the target end user or, in the case of an orthosis for instance, have to be what is considered "a custom made device".

The term custom-made device is defined in the Medical Device European regulation as "any device specifically made in accordance with a written prescription of any person authorised by national law by virtue of that person's professional qualifications which gives, under that person's responsibility, specific design characteristics, and is intended for the sole use of a particular patient exclusively to meet their individual conditions and needs".

To comply with the Medical Device European regulation, beware that the co-design of an orthosis will have to be handled under the following constraints:

- clinical evaluation / prescription with the involvement of an health professional
- it shall be a 'patient-matched" medical device and not a mere 'adaptable" one, most components of which can be mass designed and produced.

An assistive technology that shall require not only a prescription and a perfect body match but also some technical documentation and a medical follow-up to be used by the target end user should of course be considered only if/when a deep involvement of the community of health practitioners in the process is actually possible.

Examples of local needs:

Discussions with some local stakeholders in Luxembourg have given birth to two different ideas of needs that may possibly be fulfilled through co-design activities and the support of 3D printing:

- prehension and/or comfort optimization in people with reduced range of motion of the upper limbs (especially the hand), limited strength or movement disorders (tremors, parasitic movements, ...). Such aids can be designed and produced at the local Fab Lab.

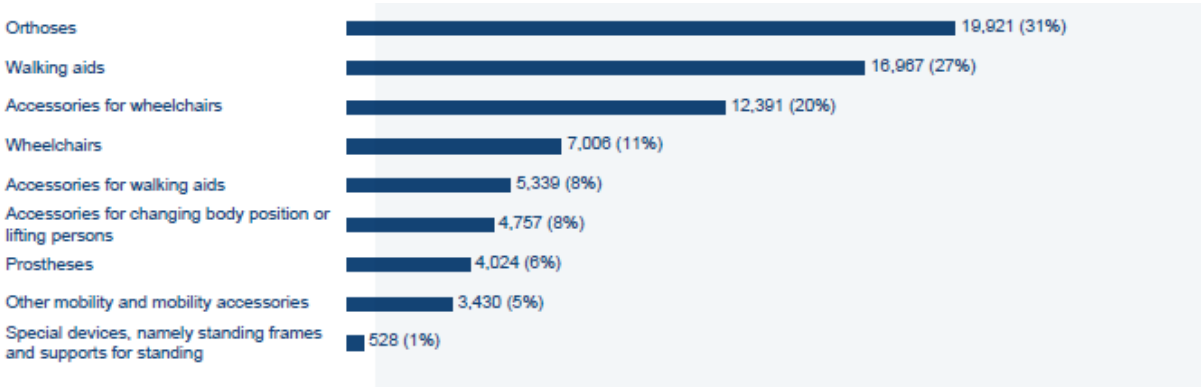
- An aid for the practitioners and not directly the patients, that would support the quality of the care and would be used to train the future health professionals, that is to say 3D printed dummies with sensors providing critical tactical feedback, to simulate the pressure points for the therapists, that could be co-designed and tested with the patients at local level. That would require to work with various flexible photopolymers which allow to control the pliability of the target areas but that can possibly be achieved with some technical partners and would have the advantage of training the health practitioners with the support of 3D, creating awareness and interest for 3D printing among them at a very early stage.

Those examples illustrate the different uses that can be made of technologies with different purposes and in different contexts but always with an improvement and impact in terms of condition and care for the disabled people.

Examples of further needs and what can be done:

At broader level, here are the needs that have been expressed and identified in Europe as a relevant technical challenge to address by various stakeholders:

Technical aids for mobility: according to WIPO, there was a need and demand for the following technical aids in 2021:



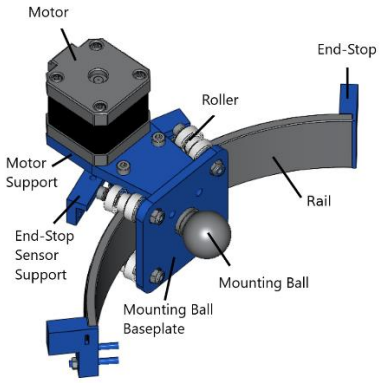
Most of the direct demand from the target end users was for accessories for wheelchairs and walking aids. Those aids can be designed and produced in collaboration with companies but also directly for individuals, based on their own needs and instructions. They are therefore worth to be considered for co-design and adaption of the existing aids to the specific needs of a given end user .
Here are some examples of accessories for wheelchairs that can be 3D printed. The 3D printed components can possibly be combined with simple laser-cut or electronic components that are available at Fab Labs :

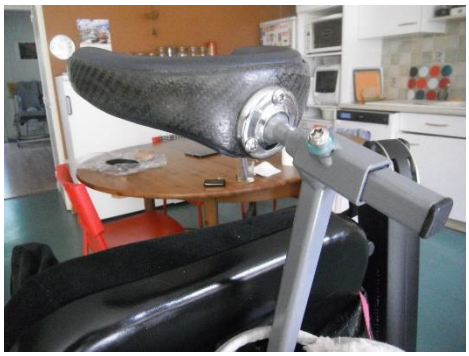
Tablets

Customised boxes for medical equipment

Adapted joysticks (KapLab)

Trailers (Fab Lab Berlin)





rotating headrest for wheelchair (Human Lab)

The same can be considered for walking aids, e.g. customised boxes and adapted handles for models commercially available:

As far as the wheelchairs are concerned, further needs that can be addressed include customisations such as:

- adapting the opening of the footbrace
- adapting the braking system
- adding a fifth wheel to better control the direction of the wheelchair

(Human Lab)

and in the case of walking aids tripods and holders for walking sticks:

(Fab Life)

Emerging technologies for mobility purposes include:

- self-driving wheelchairs,
- smart canes,
- smart prosthetics
- 3D printed prosthetics
- exoskeletons

Those technical aids are a bit more complex to produce and may require collaborations with companies or research centres. There are however toolkits that can be used to work on simple prototypes; Auxivo AG, a spin-off from ETH Zürich, thus offers some robotic toolkits which can be used by makers interested into working on small exoskeletons. The basic kit contains a digital handbook (PDF) and the STL files of all the exoskeleton parts. Use of the toolkit only requires access to a 3D printer, sewing, soldering, and being able to afford the cost of the electronics. Such kits are especially relevant for a greater involvement of the end users and makers in the co-design process and possibly adding a practical training module to the technical ones available in DEEP (for Training Of Trainers purposes).

Last but not least, complete walking aids may also be considered, especially for children:

(Human Lab)

Technical aids for self-care: the demand for assistive technologies for personal care is mostly related to adaptive clothing, eating devices as well as products for body, hair, facial and dental care. The demand comes directly from the end users and those needs can typically be easily fulfilled at Fab labs without a need for deep professional involvement or support from specific technical partners. There are
however still a number of possibilities for co-design and collaborations between professionals and makers in the field of selfcare, as illustrated by the joint design and manufacture of adapted shoe soles at KapLab in Belgium:

(KapLab)

Here are some further examples of assistive technologies that can be 3D printed:

Motorized cup holder
(KapLab)

Adapted chopper
(KapLab)

Holder for yoghurt pot
(Fab Life)

Silverware holders (Minifactory)

Adapted can opener (Fab Life)

Other assistive technologies that can be considered are the ones providing support for making a specific movement rather than an alternative to it. That brings us back to the design of simple orthoses, e.g. a motorized thumb orthosis for being able to grip an object:

(Human Lab)

Many examples of aids are for people suffering from motor impairments but as indicated in the "Needs for assistive technologies" section, mental impairments should be further considered and the needs of those communities further and better addressed with the support of technologies. Here is an example of a device that was made at a Fab Lab to support autistic people in the field of self-care.

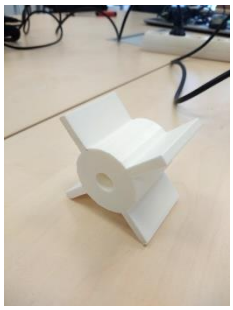
The system induces them to drink water in an autonomous way through a simple gamification process:

(Human Lab)

Technical aids for telemedicine and self-medication as well as feeding assistant robots are emerging assistive technologies in the field of self-care. Those are typically designed by companies and experts but some needs in the field of self-nursing can be fulfilled by makers. Adapted holders for instance can allow the disabled people to better handle and more easily carry the medical equipment they typically need to use on a daily basis:

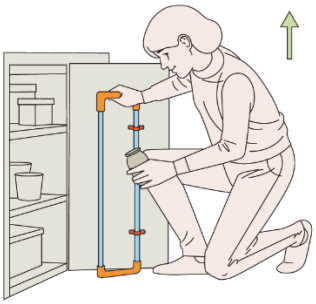
Oxygen tube and oxygen tank holders (KapLab)

Adapted home and furniture: as indicated in the "Needs for assistive technologies" section, the commercial offer is growing in this field but there are still some needs for accessories and aids to be able to use standard furniture and equipment. The demand is equally coming from the target end users and the professionals.
Here are some example of relevant technical aids that can be 3D printed:

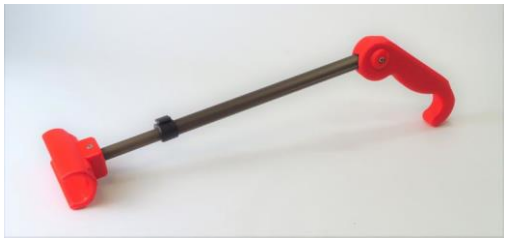


Adapted shower faucets to facilitate gripping (Fab Lab des Fabriques)

Safety bar for shower seat (Human Lab)



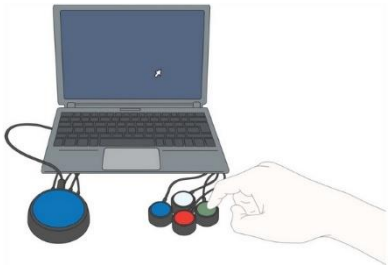
Handle to stand up to be fixed in the furniture (FabLife)



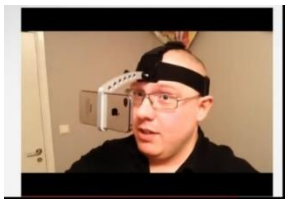
Technical aid to open doors (Human Lab)

Assistive technologies to support communication: technical aids in the field of communication often refer to software but a number of hardware tools can be relevant to disabled people to support handwriting and as facilitators for using standard ICT equipment.
Here are some examples of assistive technologies that can be 3D printed and fulfil some actual needs that have been expressed by some end users:

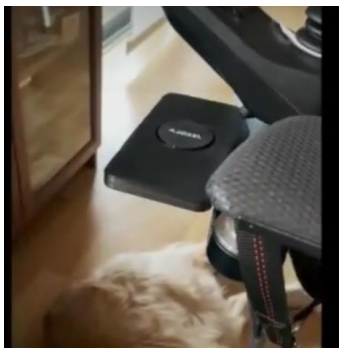
Writing tool (Designboom)



Button mouse (FabLife)

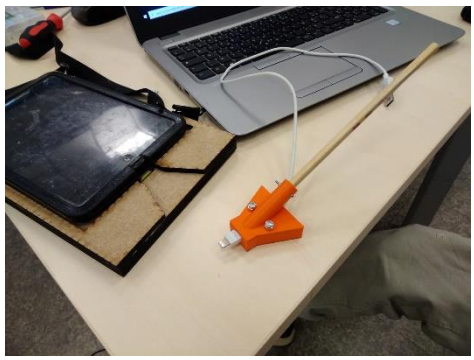


Head strap mount



Magnetic device to fix a phone on a wheelchair (Fab Life)

foot activated trackball (Fab Lab des Fabriques)



Inserting device for charging cable

Beyond supporting the use of standard ICT equipment, innovative devices can be designed and 3D printed to be used standalone or connected to e.g. the control system of a wheelchair. Fab Lab des Fabriques has thus created an infrared box to be used in the classroom. Put on the desk of the teacher, it can be activated from a wheelchair as an alternative to raising hand, to let the teacher know that a student is willing to ask or answer a question.

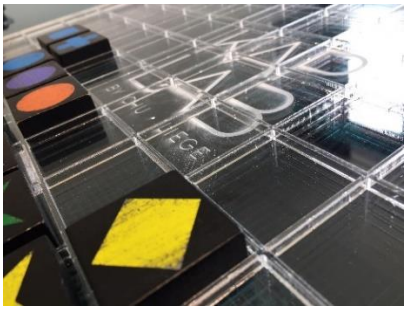
Emerging communication aids include touch-screen technology, which has proven very helpful for children with autism who struggle with motor coordination. Instead of using a pencil to write words or when trying to pick up cards with specific images, a smartphone or tablet application allows the child to type, choose, and swipe options of what they want to say, answers to lesson questions, and more.

Those end users may also benefit from gamified lessons and/or text-to-speech options.

The demand here is mostly on software and is being addressed by ICT companies but a customised hardware piece such as an adapted keyboard can support the communication. Special overlays that customize the appearance and function of a programmable keyboard are relevant especially for people with learning disorders to facilitate interactions with software applications as well as comprehension.

Assistive technologies for sports and leisure: as indicated in the section on the "Needs for assistive technologies", this type of aids is especially relevant to fulfil the emotional personal needs of the end users, which should be addressed on top of the basic ones. Fun, recreation and leisure activities often represent an unmet need. Moreover, this field offers opportunities for multidisciplinary collaborations beyond the one between health professionals and makers which are at the heart of the co-design approach in DEEP. Designers as well as the sports and cultural associations can be put in the loop for a greater engagement of citizens in the design of assistive technologies. That approach is very supportive of greater inclusion of the disabled people into the social community.
Here are examples of 3D printed solutions to support leisure and sports:

Adapted gaming devices, e.g. 3D-printed joysticks (Human Life)



Adapted board games (KapLab)

Dice thrower (FabLife)

Adapted cameras (Fab Lab des Fabriques)

E-reader holder
(KapLab)

Technical aid to use a brush
(Human Lab)

Adapted music instruments
(Human Lab)

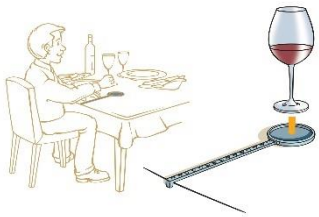
Adapted bicycle pedal
(KapLab)

Canoe paddle
(Human Lab)

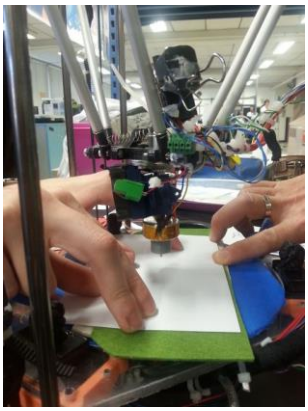
Holder for petanque ball
(FabLife)

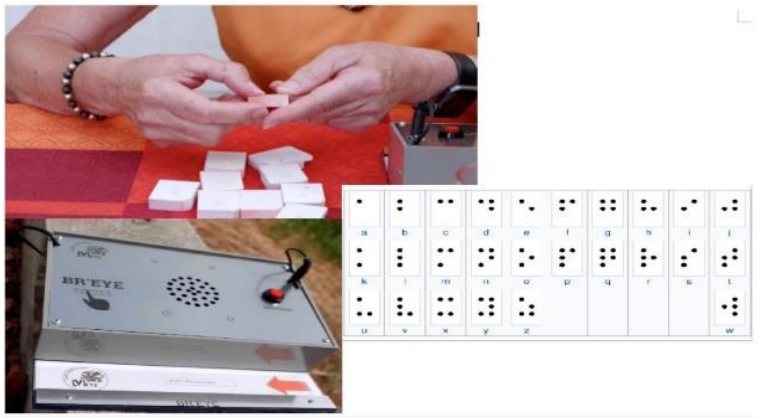
Assistive technologies for hearing: hearing aids are the mainstream and represent a highly specialised sector, which may be out of the scope of Fab Labs. However, some needs and possibilities appear in the field of signalling devices for hearing impaired people, e.g. combinations of 3D printed hardware and sensors that can turn a specific sound into a specific light.

Technical aids related to vision: mainly audio or software-based assistive technologies are being used and the demand for medical implants is out of the scope of DEEP, but tactile devices are a field which can be considered (embossed maps, aids to locate objects…). Those may or may not embed electronics and sensors.



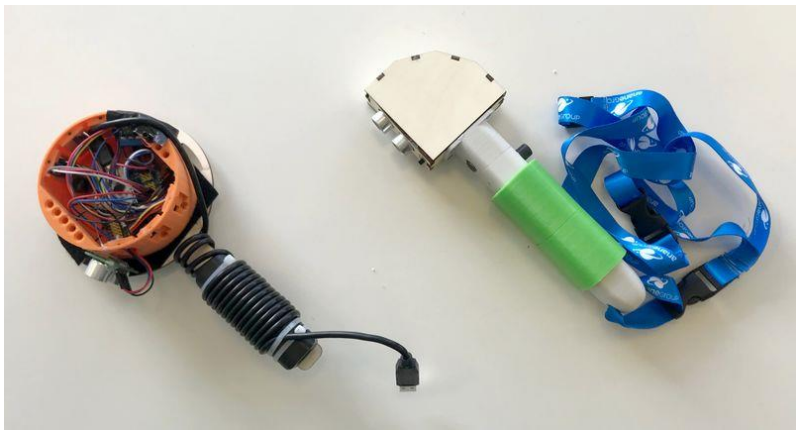
Another topic that can be addressed is the need for adapted learning material and traditional board games (that can be embossed with braille):





For mobility purposes, hand-held connected canes that detect ground relief and high obstacles, both of which cause it to emit differentiated sound and haptic warnings, can be designed and assembled.

(Human Lab)



Some hardware and software combinations can be considered. A reading machine capable of acquiring text from an image capture and reading it by means of a voice synthesis was thus conceived and assembled by some makers at Human Lab:

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Maslow, A. H. (1954). Motivation and personality.
Moody, D. Y. (2021). Challenges and Opportunities for Use of Smart Materials in Designing Assistive Technology Products with, and for Older Adults. Fashion Practice.
WIPO (2021). Technology trends 2021: assistive technologies

Practical session

The practical session starts with a brainstorming exercise during which the participants are asked to list all their ideas and thoughts for things they would like to do.
For each of the ideas, the participants are then asked to fill in the following template:

Technical feasibility check

Technical aid idea "please name the idea, e.g. silverware holder" Inventory the components of the aid and existing / possible providers of those components			
Component	Description	Provider(s)	Status of relations with provider(s)
Product			
Materials			
Product updates			
Customisation in design needed			
Additional hardware needed			
Configuration / tests needed			
Software needed			
End user training required			

Scoring of the scenarios

The trainer then ask each participant to score each idea based on the following scoreboards:

Score board 1: rating the technical feasibility

Score	technical feasibility
0	You cannot identify or cannot establish ties with adequate partners and allies to field a solution to the target end user's need OR cannot do it within 6 months
1	You can with the help of new partners and allies field a complete solution to the target end user's need within 4-6 months
2	You can with the help of existing partners and allies field a complete solution to the target end user's need within 4-6 months
3	With the help of partners and allies you can field a complete solution to the target end user's need within 2-3 months

Score board 2: analysing and rating the ecosystem and ground context

Score	the end users
0	End users… - cannot be specifically identified, or - cannot be easily accessed by you - are very few - wouldn't be able to make full use of the aid (lack of ability, resources)
1	There are well identified end users, with whom no relations may pre-exist but who can be accessed by you through new communication channels/partnerships. Those would be able to use the technical aid with extensive/new support.
2	There are well identified end users, who can be easily/immediately accessed by you. Those end users would be able to use the aid with support they already have access to.
3	There are well identified end users, who can be easily accessed by you. That end user would be able to use the aid without external support.

Score	the need and motivation
0	The benefits derived from the aid are not sufficient to easily attract target stakeholders' commitment
1	The benefits derived from the aid are sufficient to mandate a reasonable commitment of the target stakeholders after several working discussions
2	The benefits of fixing the problem are sufficient to mandate a strong commitment of the target stakeholders in the mid term
3	The benefits of fixing the problem are sufficient to mandate a strong commitment of the target stakeholders immediately

Score	the cost
0	The price of the whole product isn't consistent at all with the target end user's budget
1	The price of the whole product is consistent with the target end user's budget but may not be consistent with the value gained by solving the problem
2	The price of the whole product is high but still consistent with the end user's budget and is consistent with the value gained by solving the end user's problem
3	The price of the whole product is low, therefore fully consistent with the end user's budget and with the value gained by solving the problem

Score	the alternative offers
0	One or more other stakeholders have addressed the specific problem and are already offering relevant and affordable aids
1	At least one other stakeholder is currently working on the specific problem and the end user has access to adequate resources to address the need
2	One or more other stakeholders have tried to address the specific problem of the scenario but have failed providing a fully satisfying technical aid
3	No other stakeholder has adequately addressed the specific problem of the scenario in the local context

Score	the time and resources needed
0	The key production and distribution channels have no time or resources to deliver the aid
1	There is very limited time and resources in the local ecosystem to work on this kind of aid in the future
2	The production and distribution partners needed have the time and resources to deliver the aids in the future
3	You have the time and resources needed to deliver the aids in the future

Score	Your positioning
0	You have no prior relevant contacts and cannot easily provide positive credentials as provider of products and services to the chosen end users
1	You have some contacts with the potential end users and can provide positive credentials as a provider of products and services similar to the ones considered
2	You have some previous experiences as a provider of products and services to the target end users
3	Providing products and services to the target end users is a key element in your current practice. You are fully credible as a referrer.

Score	The potential further end users
0	Success in making the aid does not facilitate the development of any further product
1	Success in making the aid facilitates the production of further devices, the number of which is somehow limited however
2	Success in making the aid allows easy production of further devices
3	It is almost certain that the experience can be both replicated and re-used for new stuff

Evaluation of the scenarios

For each idea and each criteria, the score is reported by the trainer in an excel sheet (evaluation board):

Reference	Description of the idea	Technical feasibility	Target end users	Need and motivation	Cost	Time and resources	Alternative offers	Positioning	Further end users	Critical Criteria	Secondary Criteria	Final assessment
1			1	0						Stop	n.a	Stop
2		2	2	1	2	1	3	1	2	Average	Average	Average
3			1	0						Stop	n.a	Stop
4			2	0						Stop	n.a	Stop
5												

Critical criteria are in yellow
Secondary criteria are white

Critical criteria are evaluated the following way:

If one critical criteria is 0, stop
If number of 1 for critical criteria is >=2, weak
If number of 2 for critical criteria is >=2, average
If number of 3 for critical criteria is >=2, strong

Secondary criteria are evaluated the following way:

If number of 0 or 1 for secondary criteria is >=2, weak
If number of 2 for secondary criteria is >=2, average
If number of 3 for secondary criteria is >=2, strong

Final assessment is made the following way:

If critical criteria are stop: stop
If critical criteria are weak: weak
If critical criteria are strong and secondary criteria are strong or average: strong
If critical criteria are strong and secondary criteria are average or weak: average
If critical criteria are average and secondary criteria are strong: strong
If critical criteria are average and secondary criteria are average: average
If critical criteria are average and secondary criteria are weak: weak

It allows the participants to identify the strongest i.e. best ideas for assistive technologies that can be considered to be worked upon in DEEP.

MODULE V: The role of 3d printing in the world of disability

Introduction

The introduction of manufacturing and rapid prototyping technologies in the DEEP project makes it possible to expand the range of skills of the professionals involved in the project (health professionals and makers), which are necessary in working with the disabled.

The first contents focus on the presentation of the techniques of production and prototyping. In addition to this, with the professionals involved during the course, the basic practical knowledge of 3D printing, laser cutting and electronics, the different fields of application and the potential of digital fabrication technologies will be disseminated and shared with practical examples and case studies of their application in the field of rehabilitation therapies.

The topics covered are digital fabrication tools, 3D modelling and printing, laser cutting, vector graphics, electronics and applications in the different fields of disability.

The activities carried out in workshop mode are intended to give the professionals involved in the course an understanding of the various production and prototyping techniques, as well as practical knowledge of 3D printing and its operation, laser cutting and electronics.

Theoretical Part

Part 1: Prototyping Technologies and 3D Printing

This module covers the following topics: prototyping, different production techniques, additive manufacturing, and 3D printing in particular. Different 3D printing technologies, the common use of each of them and the most popular materials will be addressed.

'We are changing the face of personal manufacturing and changing the way the world thinks about things' Bre Pettis.

This phrase introduces the topic of digital fabrication and how it is changing the world of manufacturing and personal fabrication. Bre Pettis together with Zach Smith
is the founder of MakerBot Industries, a pioneer in low-cost 3d printers, in 2009, in a former brewery in Brooklyn, they started to produce $1000 3d printers, its simplicity allowed anyone who owned one to make plastic products from a digital file.
Digital fabrication technologies have spread all over the world thanks to the Makers movement and the emergence of numerous Fablabs all over the globe, i.e. a type of low-cost digital lab that allows people to build things they need with analogue and digital tools. A simple idea with important results. The first Fablab was founded in 1998 by Neil Ghershenfeld, professor and director of the Center of Bits and Atoms at MIT in Boston, with the inauguration of the course ***How to Make (Almost) anything.*** The course was aimed at a small group of final year students from different fields and specialisations who together worked on the development of projects that they prototyped and produced with the tools available in the lab (3D printers, laser cutters, electronic components, microcontrollers, sewing machines...) some examples are Kelly's Scream body, which focused on her problem of having to scream at inappropriate times. The result is a backpack worn on the front that becomes a personal space for screaming, capable of recording the screams and playing them back later when and how the person decides. Another example is the project by Meejin Yoon, a professor in the Architecture department who, like Kelly, had no technical experience. Meejin attended the course to be able to make the objects herself, impressed by how technology intrudes abusively into our personal space, she wondered if she could help define and protect it instead. So she came up with the Defensible Dress, inspired by the behaviour of the hedgehog and the puffer fish defending their personal space. His device looks like a dress with a swaying hem, but the fringes are rigid threads connected to the dress via small motors controlled by proximity sensors. When someone approaches within a determined distance of the person wearing the dress, the wires pop out to delimit and protect the personal space around them. These projects were realised by the just-in-time cooperation of people with skills in a shorter time frame than the dynamics of corporate prototyping and production. This created a new, more fluid production model and a new training concept based on the just-in-time exchange of information between different professional profiles leading to a contamination between different skills. **DON'T DREAM IT, BE IT...**

The development of consumer technology and affordable assistive devices has resulted in the rapid prototyping and creation of assistive technologies based on 3D printing, laser cutting of ergonomic profiles, and programmable microcontrollers. Interaction between physical devices and computers has never been so easy and
immediate, and the IoT, Internet of Things, together with the easy programmability of the peripherals themselves, takes the creation of 'tailor-made' products for people with disabilities to levels that were unattainable before, thanks also to the contribution of skills from open shared laboratories such as Fablab, Makerspace, Hackspace; with the aim of creating open source software solutions for disability that everyone can freely download, modify and redistribute and, above all, use.

" With Fablabs, digital fabrication technologies have become accessible to all"

After this introduction to the world of digital fabrication, 3D printing and FabLabs, it is important to discuss the differences between certain fabrication technologies. In order to create a more direct and related comparison to digital fabrication technologies, we will discuss Forming Technologies, Additive Technologies and Subtractive Technologies. Forming technology consists of deforming a material onto a mould of the object to be produced; the characteristics of this type of production are the possibility of producing large volumes of the same part; large initial investment. Subtractive technology involves removing parts of material from an initial part to give it the desired shape the oldest form of subtractive technology is sculpture, this technology is best for parts with relatively simple geometries; for low to medium volume production; the material is usually metal or wood. Additive technology more commonly known as 3D printing involves producing an object by adding layers of material until the desired shape is obtained, suitable for complex designs; low volume production; rapid prototyping.
In the subtractive process, unneeded material is removed from a block until the final object is obtained: just as Michelangelo saw his creation emerge from marble, from which he detached small parts with a hammer and chisel, so we can use lathes and milling machines to produce even very complex shapes.

The lathe is a machine tool that allows excess material to be removed from a workpiece fixed to a rotating table using a series of bits of various shapes. The lathe is not a novelty of our century: the first hydraulic lathe is more than 500 years

old, but the history of the lathe goes back as far as 2,500 years, when the Greeks and

Egyptians created the first machines that allowed a plate to rotate by operating on a pivot with their feet.
Modern lathes are more complicated and versatile, they use motors instead of human power and can have a very high degree of automation, but they are based
on the same principle that our ancestors used to make the first regularly shaped pots.

Milling machines are much more modern and allow the production of even very complex parts. Milling machines operate in a similar way to drills, except that instead of drilling, i.e. using the tip of the tool, they normally work by cutting. In short, the industrial version of manicure sets with the rotary file (and the pacific version of rotary blades). The simplest milling machines work on three axes, while the more complex ones can also work on five or six axes, as well as allowing rotation with respect to the axes themselves, so as to reach (almost) any part of the workpiece. Milling machines can machine a wide range of very tough materials, from wood to metals. The other side of the coin is that the harder and more resistant the material to be machined, the more resistant, heavier and bulkier the milling machine has to be, with a consequent increase in cost and size that makes professional machines absolutely unattainable for the average hobbyist, who has no choice but to make do with smaller and simpler milling machines.

CNC machines
Both of the machines we have seen started out as manually controlled tools, but over time have evolved into CNC machines, where the operator sets simple programmes on a console. In particular, it is now common to find them in the computer numerical control, or CNC (Computer Numerical Control) version,
i.e. controlled by a computer that directly manages the transition from a 3D model created with a CAD (acronym for Computer-Aided Design) application to the production of the object. The connecting link is a new type of software calledCAM(acronym for Computer-Aided Manufacturing), which transforms the digital representation of the object into a series of commands to be given to the

machine. The format used is a standard called G-code, which provides instructions of the type

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N40
G82 X1500.
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They are not very understandable to the uninitiated, but fortunately nowadays they are generated automatically by specialised software.

3D printers are also CNC machines; the only difference is that instead of removing material, they add it.

Additive manufacturing or 3D printing is a prototyping and production technology that allows an idea to be quickly transformed into a product via a digital file. 3D printing is used in almost all sectors from design to jewellery, automotive to medical..., an example of the potential of 3D printing was what happened during the Covid 19 emergency. During this emergency, hospitals had a shortage of "venturi" valves for artificial respirators and CPAP valves to convert snorkel masks into CPAP respirators, and thanks to the Makers' network and 3D printing, it was possible to produce more valves than the emergency demand in a couple of days, which would not have been enough time to produce the mould for industrial production.
Ask the participants when 3D printing was born, wait for their answers (most of them will almost certainly say in the late 1990s or late 1990s/early 2000s) and comment on their answers to introduce a bit of the history of 3D printing, which was born in 1985 with a patent by Chuck Hull, an American engineer who invented the SLA 3D printing technology and founded the 3D system company, a giant in the field of professional/industrial 3D printing. These were the years of Star trek: The Next Generation in which the Replicator was seen as a machine that was capable of producing whatever was needed in each episode, and it was this Replicator that inspired the inventors of 3D printing technologies.
From 1985 to the mid-1990s, 3D printing technologies and usable materials and colours were defined, but the real turning point for the spread of 3D printing was the creation of easy-to-use printers made with simple components destined for the consumer market and to enter people's homes. This came about thanks to the open source release of FDM technology patents that allowed engineers, makers, and enthusiasts to develop and make their own desktop 3D printers. The first open source 3d printer project capable of producing parts is the RepRap (Replicator

Rapid) project created in 2005 by Dr Adryan Bowyer, Senior Lecturer in Mechanical Engineering at the University of Bath, UK. Below is a link to an interview that you can share with the course professionals:
How he started the worldwide 3D printing revolution / Adrian Bowyer **(285) How he started the worldwide 3D printing revolution / Adrian Bowyer - YouTube** .
Since the open source patenting of FDM technology, a group of three people including **Bre Pettis** founded Makerbot Industries, a start-up in Brooklyn and began producing customised 3D printers that arrived at buyers' homes in kit form or assembled and ready to use, their project spread across the globe, the start-up became a company and was acquired in June 2013 by Stratasys, the world leader in 3D printer marketing]. The 3D printing technologies can be schematised in the following order:

- **STEREOLITHOGRAPHY (SLA)**
  SOLID, FLEXIBLE OR CASTABLE METHACRYLATE MATERIAL,
  SINGLE COLOUR

- **SELECTIVE LASER SINTERING (SLS)**
  NYLON-METAL-COMPOSITES

- **PAPER 3D LAMINATED PRINTING (LOM)**
  PAPER
  MULTICOLOR

- **FUSED DEPOSITING MATERIAL (FDM)**
  PLA-ABS-NYLON-LAYWOOD-KENESIS
  SINGLE-COLOUR EXTRUDER

- **COLOUR JET PRINTER (CJP)**
  VISIJET PXL (POWDER CHALK)
  CMYK COLOR

- **3D PRINTING LIQUID DEPOSITION MODELING (LDM)**
  CERAMICS-CLAY

The detailed technology that will be used in the workshop with professionals and people with disabilities is FDM, a technology that uses a filament of plastic material

that passes through a heater and extruder is deposited on the build plate and layer upon layer produces the desired object in the digital file. The most commonly used materials in 3D FDM printing are PLA, ABS,PET, LAYWOOD, CRYSTAL FLEX, PLA LAYBRICK, PVA, HIPS; each material differs in composition and extrusion temperature

PLA, the most widely used material for 3D printing, is the polymer of lactic acid.

The main properties are rheological, mechanical and biodegradability.

Rheological: elasticity of the melt is lower than that of olefins.

Mechanical: varies from that of an amorphous polymer to that of a semi-crystalline polymer; properties intermediate to those of PET and polystyrene. Glass transition temperature is higher than room temperature; transparent materials are obtained.

Biodegradability: as produced, it is not biodegradable; it becomes biodegradable after hydrolysis at temperatures above 60 °C and humidity above 20%. Commonly used plastics have an average life of 100 to even 1000 years. PLA, on the other hand, has a much shorter biodegradation time: depending on the environment in which it is dropped, it has an average life of 1 to 4 years.

Pro:

- It can be recycled and/or composted.
- Even dispersed in the sea, once dissolved or reduced to microplastics, it is not toxic to fish or humans if ingested.
- It eliminates dependence on oil.
- Even burnt, it does not release heavy metals or toxic gases.

Cons:

- Cannot be used to make 'backyard' compost as it needs industrial conditions to be broken down (high temperature).
- In a normal landfill, i.e. not exposed to sunlight, the time for decomposition is comparable to that of normal plastic.
- It only takes a relatively small amount of PLA to contaminate a separate plastic collection as it cannot be recycled together with normal plastic, preventing recycling and stopping profits for plastic recycling companies].
- The cultivated area used to produce the raw material is taken away from the production of food for humans.

The main components of which a 3D printer is composed and which are essential for its operation are: Stepper motors that precisely manage the movement of the extruder in space,

The extruder assembly consists of a motor that pushes the filament into the heater

which, after passing from solid to molten state, is extruded through the brass nozzle onto the printing plate.

A printing plate, which can be made of aluminium, glass, composite, smooth or micro-perforated; the most commonly used ones are also heated so that the extruded material adheres better and prevents detachment from the plate during printing, which would result in printing failure

Helical screws, which together with stepper motors are used to move the printing plate.

Microcontroller, an electronic board on which the firmware is loaded that, connected to the electronic components, manages the mechanical handling, the extrusion temperatures and the entire printing process.

To produce/prototype an object with the 3d printer we have said several times that we need a digital file, the digital file we need contains the geometry of the object to be printed, these object geometries can be found on online platforms where there are files of objects ready to be printed or we can draw with software designed for 3d drawing also called CAD or NURBS.

CAD AND NURBS SOFTWARE are software that support three-dimensional drawing in virtual space by simulating the view of the object as if it were in real space. With these software we can draw any geometry we want in 2D or 3D and export the digital file to produce it with 3D printing.

Other useful software for digital fabrication are CAM software used to design machine paths for production with CNC milling machines that work by subtraction.

When we design an object with 3D modelling software, the geometry we generate is defined by a cad surface. In order to be used for 3D printing, this geometry must be converted to MESH, which is done automatically in most software when the drawing is exported to an STL file.
Mesh geometries are defined by polygons having at least 2 vertices in common with each other.
After generating the file in STL format, we can upload it to the slicing software.
Slicing software is a programme for transforming a 3D file into a file that can be interpreted by the 3D printer.
The slicing software converts the 3D model into instructions and codes that will be interpreted by the 3D printer that will produce the object equal to the 3D model designed. In the slicing software, all the printing parameters are set, i.e. print material, extrusion and printing plate temperature, layer height that defines the

surface finish of the printed object, percentage of the object fill, and any media to be used. the tutor will have to learn more about slicing software compatible with the printers he/she will use during the practical and workshop sessions in order to transfer the skills of setting the printing parameters and starting up the printer.
Question & Answer

Part 2: Laser cutting and vector graphics

To understand laser cut technology, one must first know the basics of vector graphics and then the use of laser cutting machines, which can be used to process wood and plastic. Along with 3D printing, this is another rapid prototyping technology commonly used to produce working prototypes of our ideas and is often found within Makerspace fablabs.
Laser cutting is a popular technology that uses a strong laser beam to vaporise different materials, resulting in a cut edge. Although typically used for industrial manufacturing applications, it is now used by schools, small businesses, architecture and hobbyists. Laser cutting works by directing the output of a high-power laser, usually through an optic. The laser optics and CNC (computer numerical control) are used to direct the laser beam onto the material. A commercial laser for cutting materials uses a motion control system to follow a CNC or G-code of the pattern to be cut on the material. The focused laser beam is directed onto the material, which then melts, burns, vaporises or is blown away by a jet of gas, leaving an edge with a high quality surface finish. Like all digital fabrication tools, the laser cut is a numerically controlled machine. In this case, the computer controls motors that move a laser in a Cartesian plane. The laser can draw a thin line in a sheet of material or, by varying the intensity, it can create a kind of engraving in it. If you can draw an object in 2D, the laser cut can cut it out. but the fact that the laser cut operates in two dimensions does not mean that it cannot manufacture 3D objects. special software can take a three-dimensional object and break it down into two-dimensional planes, which can be cut out separately, even adding small interlocking elements to make a solid and easy-to-assemble kit, such as wooden dinosaur skeletons for example.

The technical specifications that differentiate lasers are: the power of the laser source, which influences the type of material and the thickness that can be processed; the laser source, the most commonly used and Co2; the working area,

which allows us to process larger or smaller supports; and the functionality, i.e. the possibility of cutting or engraving. knowing the technical specifications of a laser cut available in the laboratory allows you to understand and choose what type of material to use and up to what size you can go in the prototyping of a product, information that is also useful in the design phase of a product. laser cuts have

cutting preparation software that, thanks to the use of layers and colours, allows you to design different workings and processing powers for each part of the designed object. Before cutting, it is important to acquire a little knowledge of graphics and understand the difference between vector graphics and raster graphics.

It takes its name from the English word 'raster', which means grid. In fact, in raster graphics, or bitmap graphics, the image is composed of a grid of points called pixels, which are square in shape.

Each of those pixels has certain colour information that together create a certain image. The colour profile most often used in bitmap images is RGB because it is the profile that computer graphics cards use to generate the image itself on the screen.

The most important property of a raster image is the resolution, which is given by the number of pixels contained in a certain unit. The standard is the British inch (2.54 cm) and the ratio Dot Per Inch, DPI, i.e. dots per inch. The higher the number given by this ratio, the higher the resolution of the image and thus its quality.

A resolution of 300 dpi is considered the quality standard for a good print while 72 dpi is sufficient for a good visual quality on the screen.

Obviously, decreasing the size of the photo will increase its resolution, just as enlarging it will have a lower resolution, resulting in the so-called grainy effect, where individual squares become visible, as in the image at the top of the paragraph. Vector graphics are very different from raster graphics. It relies on geometric shapes such as lines, points, curves and polygons to generate an image, and these shapes are given certain colour or effect characteristics.

Since vector images are made up of geometric shapes, it is possible to enlarge them practically infinitely without losing any resolution because the geometric

shapes themselves have mathematical equations at their basis. You can see this in detail in the image above.

The difference in disk space occupied is another fundamental difference: in fact, vector images occupy far less space than raster images because the information contained in the image is much less, also making editing easier.

One downside, however, is that extremely powerful machines and software are required to obtain vector images rich in quality and detail, as is necessary in 3D graphics, for example. Or at least in the current state of technology. (What is the difference between raster and vector in graphics?) There are many software packages for preparing design files, for preparing vector graphics:

Adobe Illustrator, Inkscape, SolidWorks, Siemens NX, Catia, FreeCAD, AutoCAD , Sketchflat, Corel Draw, SketchUp...

The output file must be .ai (from Adobe Illustrator, version CS6) or .dxf.

After drawing an object for cutting, the last step is to prepare the instructions for our laser cutting machine, using RDWorks, a powerful programme that allows us to perform laser cutting engraving operations.

- It is free and very easy to use!
- Before working, the laser head must be focused at the right distance from the material.
- Focusing (automatic) - step by step:
- Place the metal board under the laser head.
- Perform the autofocus procedure.

Tadaaam! It is done. The laser head is now perfectly in focus!

We can summarise the steps for laser cut processing in this order:

- Checking the laser cutter table
- Choose and place the material on the table
- Focus the laser head
- Prepare the graphics and export the file to the laser cutter
- Draw the maximum dimensions of the object
- Carry out laser cutting

Question & Answer

Part 3: Electronics

The last part focuses on an introduction to electronics and coding. The topics

covered are the basics of different electronic components, electrical circuits and soldering.

In an electrical circuit, electrical energy, produced by a generator, is spent to operate a device: for example, a light bulb. The energy expended is electrical potential energy, carried by charges, which is converted into other forms of energy (heat and light in the case of the light bulb)

An electrical circuit is a closed path in which an electric current circulates, caused by the potential difference between the ends of the circuit. The main parts of an elementary electrical circuit are:

- A **current generator** (e.g. battery)
- A **user** (e.g. light bulb)
- A **conductor wire** that connects the two poles at different potentials
- A **switch** which is used to open and close the circuit by interrupting the passage of current

an electrical circuit can operate in two modes

- in direct current (DC)
- in alternating current (AC)

In order to realise a small electronics project, other components are needed, mainly divided into three categories:

Analog components (resistors, capacitors, diodes, transistors, ...)

Microcontrollers

Input/output devices (sensors, actuators)

The breadboard is a component used for prototyping small electronics projects

(in electronic jargon also called a **waffle** board; in Italian it is sometimes called an **experimental board or test board**) is a tool used to create prototypes of electrical circuits. Unlike the millefori board, which is a printed circuit board (on a copper-plated board) onto which the components and connections that form the prototype are soldered (and which is therefore hardly reusable), the breadboard requires no soldering and is completely reusable (and therefore mainly used for temporary circuits). Although it is normally used for prototyping simple circuits, it can also be used to test entire computers.

Coding is a discipline based on computational thinking, i.e. all those mental processes that aim at "problem solving, system design, understanding human behaviour through those concepts usually attributable to the field of computer science problem solving".

The term, coming from English, means 'computer programming'.

There are two different styles of coding

- block programming (scratch for kids, ladder programming,...)
- language programming (Java, Python, C, C++, ...).

How does one start programming?

- What is the process of planning an application?
- Where to find ideas?

Question & Answer

Practical part

Participants will be guided through the process of cutting 3D models and preparing the printers to turn their ideas into a real product.

Exercise 1:
Carrying out a simulation of the 3D printing process, using a 3D model downloaded from an open source online library, allows the trainer to understand whether the professional who has followed the course has acquired new skills on 3D printing and a sufficient level of autonomy in the management and control of the 3D printing process, setting the printing parameters, preparing the G-Code file and starting the printer.

- download a digital file from the object library on the site ; Thingiverse - Digital Designs for Physical Objects
- upload it to the slicing software and set the printing parameters to print as required by the trainer
- upload the file to the 3d printer, check the printer components and start printing

Exercise 2:
Carrying out a simulation of the laser cutting process, using a 2d drawing made by the professionals who have followed the course with vector graphics software, allows the trainer to understand if the professional who has followed the course has acquired new vector drawing and laser cutting skills and a sufficient level of autonomy in the management and control of the laser cutting process, setting the cutting parameters, and starting the work.

- draw an object with vector software, generate a digital file in AI or DXF format

- upload it to the machining control software, set the cutting parameters and start the machining process

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PART II: METHODOLOGICAL GUIDELINES

Premise

An individual's condition of disability descends from the negative interaction between health deficits and the environment in which the person lives. The difficulties are mainly related to the identification of limitations in functioning and the interaction of them with the living environment.

Disability, therefore, is a complex phenomenon that reflects the interaction between the person and society, it is the result between a complex relationship between an individual's health condition and the various personal and environmental factors that represent the circumstances in which the individual lives.

Considering this complex interaction between the various factors that determine a disabled condition, the methodological approaches contemplated in the DEEP project cannot be applied in a standardized way:
the variables that come into play and interact with each other concern both the person with a disability (e.g., type of disability, age, gender, disability-related history, life context etc.) and the different modes of intervention and skills of professionals (personal characteristics, work context, shift management etc.).

For this reason, the following will outline guidelines for better and correct application of both the motivational approach and prosocial methodology in the field.
These guidelines are limited to being indications that professionals can follow to best implement such models, so they must be considered always keeping in mind the different application contexts and different interaction systems of a disabled condition.

Methodological guidelines of the motivational approach

The motivational model (DiClemente & Prochaska, 1992) will be particularly useful when the professionals can implement it on the field when dealing with people with disabilities.
After the pilot training course, healthcare professionals will be able to motivate participants with disabilities to actively adhere to rehabilitation-care treatments (treatment compliance), while makers will motivate them to take part as co-designers in the laboratory activities.

However, there is no 'motivational recipe' that is able to manage change processes in a standardised way and thus enables the best use of this model.
Each professional has a mode of intervention depending on his or her professional skills, the time available, the context and the type of target. As can be seen, there are several variables that determine the success or failure of a motivational intervention implemented.

This is why we limit here to providing only a few indications that represent guidelines for the correct implementation of this model on the field.

- A short motivational intervention takes 10 to 15 minutes. It can be carried out by any trained professional who has the time. It ends with a goal of change. It does not foresee follow-up sessions that are not linked to feedback on the outcome and support, even by telephone, for the change process.

- It may be useful for our target professionals (health professionals and makers) to have general recommendations on health issues to present or comment on with the person, before starting the motivational intervention.

- If the person requires individual or structured group intervention, the professional can make a referral to specialist services and/or can provide information on groups in the area (or online support groups) that support people experiencing difficulties and who would like to change their situation.

In addition, in order to best adopt the model, the professional must always remember to:

- have a non-judgmental attitude;

- be aware of personal prejudices, attitudes and behaviours about lifestyles "considered at risk";
- recognise that it is difficult to talk about individual lifestyles;
- pay attention to the person's general attitude to the questions asked (to catch any signs of discomfort expressed by non-verbal communication: gestures, posture...).

The basic principles for conducting motivational intervention can be summarised in the following points:

1. Communication style: assertive/concertive.
2. Active listening implying empathy, ability to reformulate, ability to summarise and activate processes that support change.
3. Ability to make a diagnosis of the motivational stage.
4. Ability to give reinforcement.
5. Attention to non-verbal communication (gestures and mimicry congruent with the motivational style).
6. Attention to the quality of the setting (do not expect interference: telephone ringing, concentration on the PC, haste, sources of distraction for oneself or the person).
7. Ability to help define concrete and specific change goals.

Some practical advice...

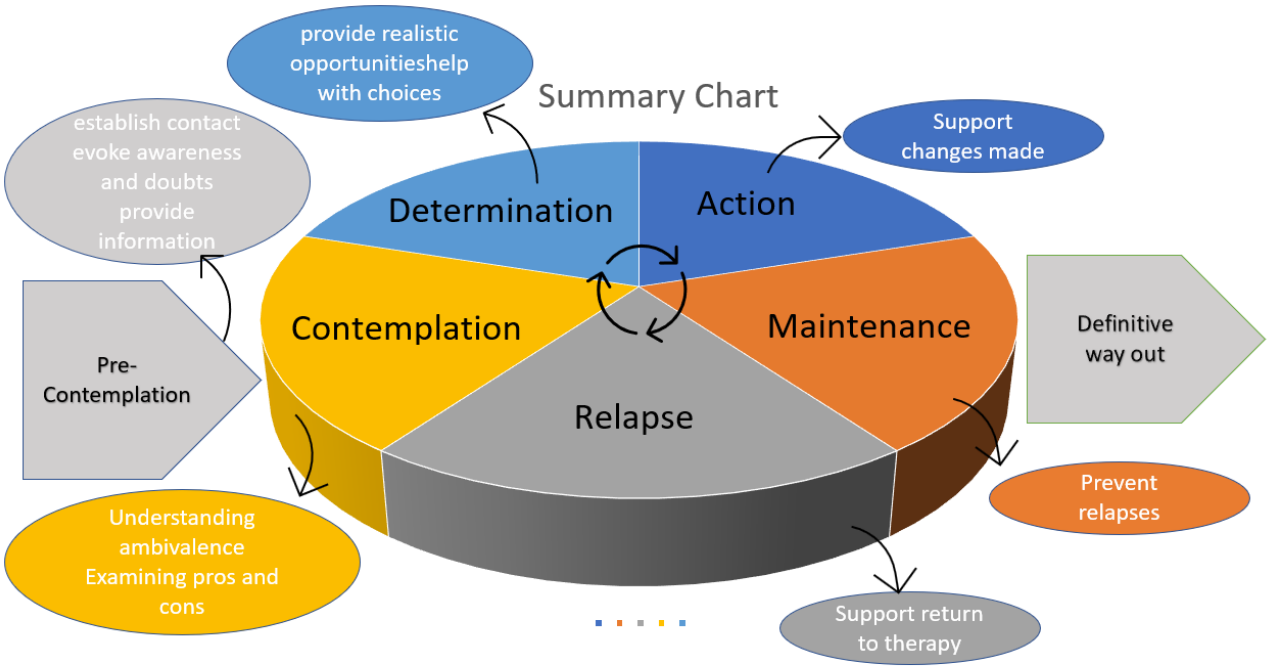
To consolidate and foster the assimilation of the main processes and steps involved in using the motivational model, a good technique could be to display whenever deemed appropriate: the summary table containing the main theoretical contents of the model; the chart relating to the stages of change and the most suitable ways to take action.

Summary table

STAGE	PRE-CONTEMPLATION	CONTEMPLATION	DETERMINATION	ACTION	KEEPING
	The person has not yet considered changing, or does not want to, or does not feel capable of it	The person admits to being worried and considers the possibility of change, but is ambivalent and uncertain	The person is planning to implement a change in the near future, but is still considering what to do	The person is actively making steps towards change, but has not yet	The person has achieved the initial goal and is still actively working to maintain the acquisitions

			concretely.	reached a state of stability	
Readiness to change (RC)	Absent RC	Low/ insufficient RC	Increased but insufficient RC	High RC	Non-existent for change achieved
Decision Balance (DB)	Absent DB "I am not unhappy or worried."	DB starts to increase/doubts "on one side... on the other"	Very high DB "I am very worried"	High DB with oscillations "I am already doing something, but sometimes I can't, then I feel bad..."	Non-existent "I am satisfied with the results"
Self-efficacy (SE)	Absent SE	Very Low SE "...I can't do it, it's too difficult, it's tiring..."	Low SE "even if it is difficult, I have to find a way".	Low SE with fluctuations "I know I can still give in but I think I can change"	High SE "I can even when I don't feel like it"
Intervention goals	Raising awareness and doubt Providing information Maintaining contact	Understanding ambivalence Examining the pros and cons	Providing real opportunities Helping to determine choices	Supporting the changes made	Reinforcing change Preventing relapse
Possible interventions	- Do you think that changing your habits might make you feel better? - Have you ever thought that your condition might improve if .....? - I understand that you do not want to have this discussion....but it is important for your situation. - You know that ... (provide	-It seems to me that you want to change but something is holding you back. - What are the negative and positive aspects of your behaviour?	- Now that you are convinced that a change is important, how do you think you can implement it? - From 0 to 10 how much would you like to change your lifestyle? - What are the next steps you would like to take?	- You made a difficult but right choice, how do you feel? - How does the new lifestyle you are adopting make you feel?	- Have you noticed that returning to your old styles of behaviour makes you feel worse?

	information material)		- How much and what help would you like?		



The observation protocol could also be used by each professional as an effective self-assessment tool.
Some items focus on the communication strategies considered, such as active listening or the ability to ask lifestyle questions.
This is an application exercise that enables the professional to identify the patient's prevailing motivational stage (pre-contemplation, contemplation, determination, action) and to self-assess his/ her reactions to it.
The forms and instructions of the protocol for observing the motivational competence of different motivational stages can be found in the DEEP project didactic manual.

Methodological guidelines of the prosocial approach

Why Prosociality? Theory and benefits:
"Prosocial behaviours benefit other people, groups or social goals according to their criteria, without the autor expecting external rewards, and
increase the probability of generating a positive reciprocity which will in turn promote solidarity and unity on the following interpersonal and social relationships, safeguarding the identity, creativity and the initiative of the individuals or groups involved" (Roche, 1991).

Self Questionnaire Prosocial Quality Communication Model (PQC)

In the following table you find all the relevant factors of the prosocial quality communication model at one glance. You can apply it easily to diagnose your strengths and weaknesses when communicating with your patients or people with some degree of disability, and it allows you to visualize your progress! Just mark with a cross the different frequency on the right side of the table. Use different colours, each time you make this diagnose. You can also ask your patients to give you some feedback on a certain factor.

	Factors, attitudes and behaviors	5. Always	4. Almost always	3. Some-times	2. Almost never	2. Never
Previous	**1. Openness and readiness as receiver.** Do I make myself available, and do I show this to my patients, both verbally and nonverbally?					
	2. Opportunity as initiator Before giving a diagnosis, suggesting a treatment, or providing information, do I make sure that the emotional, spatial, and temporal circumstances for the patient and myself are appropriate?					
Process	**3. To empty oneself** Am I able to empty myself of my other thoughts and worries to give the patient 100% of my attention?					
	4. Live the present moment thoroughly When attending to a patient, do I concentrate fully on the present moment without distracting myself with thoughts of past or future events?					
	5. Empathy, reciprocity and unity Am I able to put myself in my patients´ shoes? Do I make an effort to know and understand their point of view? Do I give feedback paraphrasing what they have told me?					
	6. Confirmation of the other's dignity Do I affirm my patients´ value as people, calling them by name, asking personal questions, and welcoming their emotions whether positive or negative? Do I avoid undervaluing what my patients say or attempt to say, passing it off as obvious, or reducing its importance?					
	7.Positive evaluation of the behaviours of the other Do I positively evaluate any aspect, comment, or behaviour of my patients, or congratulate their progress or efforts, at least at some moment during our interaction?					
	8. Quality Listening Do I make an effort both verbally and nonverbally, to make my patient feel that I am listening attentively?					
	9. Quality emission Do I communicate information to my patients in the friendliest and clearest manner appropriate for their personality characteristics, culture, and age?					
	10. Acceptance of what is perceived as negative Do I accept anything					

	negative that the patients might see in me, as well as anything negative I might see in them?					
	11. Conflict resolution from a positive perspective Do I try to resolve conflicts in a manner that is constructive and enriching both for the patients and for my relationship with them?					
	12. Shared decision taking For decisions that affect the patient, do I include them in the decision-making process as much as possible, making them feel like they play a part?					
Contents	**13. Appropriate, relevant, not excessive, representative and frequent information** Do I choose the most appropriate amount and type of information for patients, based on their individual characteristics and present situation?					
	14. Openness to reveal emotions Do I express my emotions (worries, doubts, joys) to patients, or my expectations regarding the issues we face?					
Meta-communication	**15. Checking and controlling the communicative Process** Do I concern myself with checking that my communication with the patients is completely?					
	16. Making explicit the structural rules of the system in a prosocial way Do I try to explain openly and intimately the rules and protocol that must be followed throughout treatment, without undervaluing or overprotecting the patient?					
After the communicative act	**17. Cultivate and carry out an empathic and concrete goal** Do I take it upon myself to make patients feel as though I remember them and am concerned with them? Do I show interest in what was discussed the previous time we met?					

PREVIOUS

1. Openness and readiness as receiver: The receiver is characterized by a general readiness to leave his/her activity in order to attend the initiator of the conversation

2. Opportunity as initiator: The Initiator observes whether the state of mind of the Receiver as well as the proper state of mind is adequate to the content of the communication that he/she tries to initiate.

PROCESS

3. To empty oneself: Liberation of contents and emotions immediately previous to the current communication process.

4. Live the present moment thoroughly: Liberation of prejudices against the other person, originated by experiences or memories of the same person in other situations and moments.

5. Empathy, reciprocity and unity. To give feedback characterized by:
5.1 the verbal expression to be perceiving the perspective of the other, to be understanding his/her conceptual representation of the world (cognitive empathy),
5.2 Use of verbal and non-verbal resources to show empathic attention. To be responsible for improving the quality of the relation, based on the comprehension, recognition , respect and esteem of the point of view of the other.

6. Confirmation of the other's dignity: To recognize the other as a person, and therefore, as somebody in possession of dignity, and to recognize the other as a source of communication, of information and deserving attention and interest.

7. Positive evaluation of the behaviours of the other: Positive evaluation of the behaviours of the others. Praises. Positive attribution with regard to capacities and possible or probable behaviours of the other.

8. Quality Listening: Determination to adopt attitudes and behaviours of full listening, which begins with the will of "being the first one in listening"

9. Quality emission: Adaptation of tone and intensity of voice according to criterion of the receiver

10. Acceptance of what is perceived as negative

10.1 Ability to accept features, attitudes, behaviors, contents of the other which are being perceived as negative, so that they do not interfere in the current communication.
10.2 Acceptance of what the other perceives as negative in the actor. In this way, the actor it is capable of taking the proper responsibility, without interfering in the current communication.

11. Conflict resolution from a positive perspective
11.1 To define if the type of conflict refers to a factual problem (something that happened), to a problem of confrontation of interests (our interests are, or are perceived as incompatible), differences of principles or a relational problem

12. Shared decision taking
12.1 To establish frames of common reference: What do we want to decide and why?
What do we want to happen when the decision is taken?

CONTENTS

13. Appropriate, relevant, not excessive, representative and frequent information

14. Openness to reveal emotions: Frequent expression of positive feelings, of taste, of gratitude and of desires. Expression with assertiveness, but not in a frequent way, of negative feelings in which the other is not involved. To express oneself in the first person avoiding the direct accusation to the other.

METACOMUNICATION

15. Checking and controlling the communicative process: To apply mutually accepted rules for the interaction, to use phrases or messages to announce and prepare the other for difficult interventions, to formulate questions that stimulate the other to reflect in a new way, to paraphrase the statement of the other when the course of the conversation gets lost, climbs violently or there exists the doubt that anyone does not understand

16. Making explicit the structural rules of the system in a prosocial way: To state explicitly in an appropriate way the rules of our relation that are implicit and that have a negative character

AFTER COMMUNICATIVE ACT
17. Cultivate and carry out an empathic and concrete goal

PART III: EVALUATION TOOLS OF DEEP TRAINING MODEL

Premise

This section of the handbook refers to the evaluation tools used with the direct and indirect target.

Thanks to the first three annexes (tools for the direct target) we expect to evaluate the following aspects:

- Increased knowledge on the topic of disability, in particular issues related to motor, hearing, visual and cognitive disabilities.
- Increased knowledge and skills in the field of 3D prototyping.
- Increased knowledge of the world of assistive devices and relevant legislative frameworks.
- Improvement of professionals' pro-social and motivational skills, in the way they approach the relationship with people with disabilities.

Thanks to the last three annexes (tools for indirect target) we expect to evaluate the following aspects:

- Increased motivation to fully adhere to programmes and treatments that best meet their needs
- Increased sense of self-efficacy through active participation in the design and creation of the devices
- Acquisition of basic knowledge and skills regarding the use of the 3D printer

Evaluation Tools for the direct target

ANNEX I

Questionnaire on knowledges and skills for direct target

Questionnaire to evaluate the acquisition of knowledge and skills of health professionals and makers who participated in the DEEP pilot training on the following topics: disability, 3D prototyping, prosocial and motivational approaches to relate to people with disabilities.

Name: _____

Surname: _____

Age: _____ **Country:** _____

Mail: _____

Profession: _____

Professional Order to which you belong: _____

1. In what historical period disability is considered as deformity and disease?

   a) In the early 1800s
   b) Late 1800s
   c) In the Greco-Roman age
   d) In the 900s

2. What is meant by the term eugenics?

   a) The impairment of individuals as a warning to the faithful to do good works.
   b) The transition from the term handicap to the term disability

c) The reproduction of the best individuals and the elimination of individuals with some form of disability
d) The closing of asylums

3. What are the 3 levels that define disability in the 1980 WHO International Classification?

a) Limitation, impairment and disability
b) Impairment, personal activities and disability
c) Impairment, social participation and personal activities
d) Impairment, disability and handicap

4. Identify the leading concepts of a disease process in the 1999 WHO International Classification

a) Handicap, personal activities and social participation.
b) Handicap, personal activities and impairment
c) Disadvantage, limitation and impairment
d) Objectification, socialization and limitation

5. What is the main International Classification system on disability?

a) ICDH
b) ICF-CY
c) ICF
d) VADO

6. How are disabilities categorized?

a) Physical, mental, intellectual and sensory.
b) Sensory, motor, intellectual and mental.
c) Physical, intellectual and sensory
d) Motor, intellectual and sensory

7. What are the sensory disabilities?

a) Blindness, low vision and hearing loss.
b) Blindness, hearing loss and deafness
c) Blindness, deafness and deafblindness
d) Blindness or low vision, deafness or hearing loss and deafblindness.

8. Identify the correct statement:

a) Sensory disabilities affect only sight and hearing.
b) Sensory disabilities affect only sight hearing and smell
c) Sensory disabilities affect the senses sight, hearing but also touch, taste and smell
d) Sensory disabilities affect the senses touch, taste and smell but also sight

9. Intellectual disabilities concern:

a) Intellectual and relational problems
b) Psychological and relational problems
c) Both intellectual abilities and more specific disabilities such as HMs and ASDs
d) Relationship problems, intellectual abilities and psychological problems.

10. Tourette syndrome is a disability:

a) Physical
b) Sensory
c) Intellectual
d) Motor

11. In the Trans-theoretical Model which of these stages does not fall within the stages of change:

a) Pre-contemplation
b) Contemplation
c) Determination
d) Decision-making balance

12 . In the precontemplation stage, the decision balance is:

a) Low
b) High
c) Non-existent
d) Very high

13. In the Trans-theoretical Model, what are the factors that play a role in the change:

a) Self-efficacy and decision-making balance
b) Self-control
c) Sense of helplessness
d) Mindfulness

Transteoretic model
Stages of change
1 = Pre-contemplation 2 = Contemplation 3 = Determination 4 = Action 5 = Maintenance 6 = Definitive way out

14. Please label the following description of the person / patient's behavior with the appropriate stage of change him/her is in: "Start planning to start the diet"

a) Pre-contemplation
b) Contemplation
c) Determination
d) Action

15. Please label the following description of the person / patient's behavior with the appropriate stage of change him/her is in: "Denies there is a health problem"

a) Pre-contemplation
b) Contemplation
c) Determination
d) Action

16. Please label the following description of the person / patient's behavior with the appropriate stage of change in which him/her is in: "Continue to change behavior in view of a healthy lifestyle"

a) Pre-contemplation
b) Contemplation
c) Determination
d) Manteinance

17. Please label the following description of the person / patient's behavior with the appropriate stage of change in which him/her is in: "He joins the gym and starts the diet"

a) Pre-contemplation
b) Contemplation
c) Determination
d) Action

18. Please label the following description of the person / patient's behavior with the appropriate stage of change in which him/her is in: "After starting the diet, he continues to support his/her nutritional path"

a) Pre-contemplation
b) Contemplation
c) Manteinance
d) Action

19. 3d Printing is a production tecnology:

a) Subtractive
b) Additive
c) Sublimation
d) neither of the above

20. What is slicing software ?

a) a drawing software
b) a scanning software
c) a software for converting 3d models to G-code
d) neither of the above

21. Which of these materials is used in3d FDM printing?

a) PLA
b) Powder VISYJEt
c) PA12
d) neither of the above

22. Which among these materials is used in printing3d SLA?

a) Metaclirate resin
b) ceramic
c) gypsum powder
d) neither of the above

23. What is the export format of a 3d file for 3d printing?

a) DWG
b) 3dm
c) STL
d) neither of the above

24. Which of these software programs should be used to prepare 3d models?

a) adobe Illustrator
b) Rhinoceros3d
c) Excel
d) neither of the above

25. Which among these software is necessary to use for the preparation of vector graphics?

a) adobe Illustrator
b) Cura
c) Excel
d) neither of the above

26. Which of the following is a key step in using a laser cutter?

a) making a vector drawing
b) making a 3d solid
c) generate a mesh
d) neither of the above

27. Arduino is:

a) a sensor
b) an actuator
c) a microcontroller
d) neither of the above

28. Which of these items do we not need to solder?

a) soldering iron
b) tin
c) cyanoacrylate
d) neither of the above

29. Prosocial behaviours are

a) linked to empathy
b) depend exclusively on the behaviours of the other people
c) a political statement

d) a completely new invention

30. the definition of prosocial behaviours is based on

a) the respective national law
b) the cognitive capacity of the autor of the help
c) benefitting the other person according to his/her needs
d) the emotional state of the receiver

31. The interpersonal relations generated by prosocial behaviours are characterized by

a) spirituality
b) cooperation
c) taking without giving back
d) giving

32. The author of prosocial actions

a) always states his or her conditions before helping
b) does not expect any compensation in return
c) needs public recognition
d) only acts when there is reciprocity in the relationship

33. Which are important criteria for effective prosocial actions? Prosocial behaviours

a) increase trust and the probability of reciprocity and the receiver gains autonomy
b) make the receiver of the help more dependent on the author
c) increase mutual sympathy
d) causes emotions of inferiority in the receiver

34. Empathy allows me to

a) connect to the other person, because I make the effort to believe what he or she tells me without judging
b) feel exactly what the other person feels
c) have better control of the relationship
d) feel pitty for the other person, when he or she suffers a mishap

35. When listening actively to the other person

a) I ask from time to time if I have understood correctly what he/she wants to express
b) I already think about what I want to respond
c) I take care of other thinks at the same time
d) I interrupt when the other one talks for too long

36. I value the dignity of the other person by

a) saying nice things to him or her
b) comparing him or her publicly to others
c) taking interest in the unique situation and experiences of him or her while I do not question his or her value as a person
d) convincing him or her of my opinion

37. In order to obtain "Positive Presence and unity" in a group

a)I I take into account the need for belongingness and I stress positive aspects that the members of the group have in common
b) I give a party son organize fun events

c) I give out presents to all group members frequently
d) I help my favourite group members, because they seem always united

38. The factor "to accept the negative" means that:

a) I tell the other person what I do not like about him or her
b) I remain indifferent if I see that the other person has difficulties with our communication
c) I accept when the other person uses discriminatory language
d) I am aware of aspects that I do not like in the other person, and aspects the other peron does not like in me, and I do an effort that this does not affect the communication in a negative way.

ANNEX II

Questions about your experiences as a result of the Workshop about „prosocial behaviours“

Please mark with a cross:	Strongly disagree	disagree	Neither disagree, nor agree	I agree	Strongly agree	Don't know/ NA
	1	2	3	4	5	0
1.I think the aspects treated in the workshop are desireable						
2.The values mentioned in the workshops are not applicable in every day life.						
3.The methods of prosocial behaviours (e.g. 10 factors, Prosocial Quality Communication) are applicable in my workplace.						
4. I do not change the way I think, only because I have participated in the workshop						
5. The values tought in the workshops are desireable.						
6.I think that I should practice prosocial behaviours.						
7. I did not notice any changes in my behaviours.						
8. After the workshops I am more prerared to act in a prosocial way with the people around me.						
9.I have changed any aspect in my behaviours						
10.I introduce the prosocial behaviours in my workplace.						
11.I intend to behave in an even more prosocial way.						

12.I think that I will succeed in behaving in a more prosocial way.						
13.I am sure that I will succeed in behaving in a more prosocial way.						

14. After the workshop my preparedness and eagerness to behave in a prosocial way (please mark with cross):
- ☐ has increased
- ☐ remains the same
- ☐ has decreased

15.If your preparedness and eagerness to behave in a more prosocial way has increased, in which aeras of everyday life have you increased your prosocial behaviours?
- ☐in the relation with my partner
- ☐ in relation with the neighbours
- ☐ in relation with my family
- ☐ in relation with unknown people
- ☐ in relation with my colleagues
- ☐ in relation with charitable organizations
- ☐in relation with my friends
- ☐ in relation with .....

16.Since I behave in a more prosocial way, I notice change in:
- ☐ myself
- ☐ my colleagues
- ☐ my partner
- ☐ the neighbours
- ☐ my family
- ☐ the interpersonal climate at work
- ☐ other examples...

17. While taking part in the workshops on prososcial behaviors, I noticed prosocial actions around me:
- ☐ a lot
- ☐ quite a lot
- ☐ some
- ☐ few
- ☐ none
- ☐ in your opinion, which ones are worth being mentioned?.....

ANNEX III

Dear participants,
We kindly ask you for filling out this evaluation questionnaire. The questionnaire consists of several parts focusing on the evaluation of the training model and its benefits, motivation and degree of your participation and specific knowledge. Your answers are very important to us and will help to improve the level of future education. Your answers will be used only for the purposes of the project DEEP. Please feel free to answer in an authentic and honest way, your feedback is valuable for us and is appreciated. For completing of this questionnaire, you need approximately 5 minutes. Follow the instructions from your lecturer and in case of doubt, do not hesitate to ask for an explanation. Thank you very much for filling!

Training satisfaction

1. **Did you take a similar course in the past?**

   yes no

2. **The training contributed valuable contents which I can apply in my work**

Strongly disagree Disagree Agree Strongly agree

3. **Materials provided were helpful**

Strongly disagree Disagree Agree Strongly agree

4. **Content was well organised**

Strongly disagree Disagree Agree Strongly agree

5. **Questions from trainer were encouraging**

Strongly disagree Disagree Agree Strongly agree

6. **Instructions were clear and understandable**

Strongly disagree Disagree Agree Strongly agree

7. **Trainers provided quality and professional preparation**

Strongly disagree Disagree Agree Strongly agree

8. **I felt free to ask questions and comments at any time during training**

Strongly disagree Disagree Agree Strongly agree

9. **Lenght of training sessions were sufficient**

Strongly disagree Disagree Agree Strongly agree

10. **I felt that the trainer treated me like an expert in my work rather than a student**

Strongly disagree Disagree Agree Strongly agree

11. **I felt involved in the decisions during training that can affect my future work**

Strongly disagree Disagree Agree Strongly agree

Training effectiveness

10. **I have increased my knowledge of the issues discussed**

Strongly disagree Disagree Agree Strongly agree

11. **During the training I learned new information useful for my practice**

Strongly disagree Disagree Agree Strongly agree

12. **After the training, I have a greater knowledge of the subject, getting to have deepened more**

Strongly disagree Disagree Agree Strongly agree

13. Thanks to the training, my knowledge about the issue of disability, in particular the issue of movement, hearing, vision and cognitive impairment, has deepened

Strongly disagree Disagree Agree Strongly agree

14. After the training I feel an increase in knowledge and skills in the field of 3D prototyping

Strongly disagree Disagree Agree Strongly agree

15. The training gave me a clear idea how to take advantage of increased knowledge of the assistive devices

Strongly disagree Disagree Agree Strongly agree

16. The training gave me a clear idea how to take advantage of increased knowledge of the relevant legislative framework

Strongly disagree Disagree Agree Strongly agree

17. I feel an improvement in the area of pro-social and motivational skills, in the approach the relationship with people with disabilities

Strongly disagree Disagree Agree Strongly agree

Please fill in the short name of your profession:……..
(for example, a doctor, a health worker, an IT specialist, etc.)

Evaluation Tools for the indirect target

ANNEX IV

Self-assessment questionnaire
Motivation to Change

University of Rhode Island Change Assessment (URICA) Scale

Instructions: Each statement below describes how a person might feel when approaching problems in his life. Please indicate the extent to which you tend to agree or disagree with each statement. In each case, make your choice in terms of how you feel right now, not what you have felt in the past or would like to feel. For all statements that refer to your "problem", answer in terms of problems related to your situation/behavior that you would like or are trying to change. The words "here" and "this place" refer to your experience in DEEP Project.
There are five possible responses to each of the items in the questionnaire:

1 = Strongly Disagree
2 = Disagree
3 = Undecided
4 = Agree
5 = Strongly Agree

Circle the number that best describes how much you agree or disagree with each statement.

Statement	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1. As far as I'm concerned, I don't have any problems that need changing.	**1**	**2**	**3**	**4**	**5**
2. I think I might be ready for some self-improvement.	**1**	**2**	**3**	**4**	**5**
3. I am doing something about the problems that had	**1**	**2**	**3**	**4**	**5**

been bothering me.					
4. It might be worthwhile to work on my problem.	1	2	3	4	5
5. I'm not the problem one. It doesn't make much sense for me to consider changing.	1	2	3	4	5
6. It worries me that I might slip back on a problem I have already changed, so I am looking for help.	1	2	3	4	5
7. I am finally doing some work on my problem.	1	2	3	4	5
8. I've been thinking that I might want to change something about myself.	1	2	3	4	5
9. I have been successful in working on my problem, but I'm not sure I can keep up the effort on my own.	1	2	3	4	5
10. At times my problem is difficult, but I'm working on it.	1	2	3	4	5
11. Trying to change is pretty much a waste of time for me because the problem doesn't have to do with me.	1	2	3	4	5
12. I'm hoping that I will be able to understand myself better.	1	2	3	4	5
13. I guess I have faults, but there's nothing that I really need to change.	1	2	3	4	5
14. I am really working hard to change.	1	2	3	4	5
15. I have a problem, and I really think I should work on it.	1	2	3	4	5
16. I'm not following through with what I had already changed as well as I had hoped, and I want to	1	2	3	4	5

prevent a relapse of the problem.					
17. Even though I'm not always successful in changing, I am at least working on my problem.	**1**	**2**	**3**	**4**	**5**
18. I thought once I had resolved the problem, I would be free of it, but sometimes I still find myself struggling with it.	**1**	**2**	**3**	**4**	**5**
19. I wish I had more ideas on how to solve my problem.	**1**	**2**	**3**	**4**	**5**
20. I have started working on my problem, but I would like help.	**1**	**2**	**3**	**4**	**5**
21. Maybe this place will be able to help me.	**1**	**2**	**3**	**4**	**5**
22. I may need a boost right now to help me maintain the changes I've already made.	**1**	**2**	**3**	**4**	**5**
23. I may be part of the problem, but I don't really think I am.	**1**	**2**	**3**	**4**	**5**
24. I hope that someone will have some good advice for me.	**1**	**2**	**3**	**4**	**5**
25. Anyone can talk about changing; I'm actually doing something about it.	**1**	**2**	**3**	**4**	**5**
26. All this talk about psychology is boring. Why can't people just forget about their problems?	**1**	**2**	**3**	**4**	**5**
27. I'm here to prevent myself from having a relapse of my problem.	**1**	**2**	**3**	**4**	**5**
28. It is frustrating, but I feel I might be having a recurrence of a problem I	**1**	**2**	**3**	**4**	**5**

thought I had resolved.					
29. I have worries, but why spend time thinking about them?	**1**	**2**	**3**	**4**	**5**
30. I am actively working on my problem.	**1**	**2**	**3**	**4**	**5**
31. I would rather cope with my faults than try to change them.	**1**	**2**	**3**	**4**	**5**
32. After all I had done to try to change my problem, every now and again it comes back to haunt me.	**1**	**2**	**3**	**4**	**5**

Scoring

Precontemplation items	**1, 5, 11, 13, 23, 26, 29, 31**
Contemplation items	**2, 4, 8, 12, 15, 19, 21, 24**
Action items	**3, 7, 10, 14, 17, 20, 25, 30**
Maintenance items	**6, 9, 16, 18, 22, 27, 28, 32**

High scores on a SOC subscale indicate that the respondent is likely in that SOC. However, the SOC subscales are designed to be a continuous measure, therefore, the stages are not discrete, and respondents can score high on more than one of the four stages.

ANNEX V

PERCEVEID SELF-EFFICAY SCALE

Self-efficacy is the belief in one's ability to produce the effects or outcomes one wants[1].

The construct of self-efficacy is a core component of social cognitive theory, in which psychosocial functioning is determined by reciprocal interactions between an individual's personal (cognitive, biological, and affective) factors, his/her behavior, and the environment in which he/she functions.

People develop perceptions about their capabilities, and these perceptions mediate future behavior. Self-efficacy beliefs impact behavior through several avenues. Self-efficacy beliefs influence the course of action an individual chooses; that is, most people choose a course of action in which they feel competent rather than one in which they do not. In addition, one's belief in one's ability to succeed influences the amount of effort expended, the extent of stress experienced, and the degree of perseverance in the face of difficulties.

Self-efficacy has been shown to be a strong predictor of health behaviors[2], and as such it can be an important modulator, for example, of the experience of illness. Studies have shown that specific self-efficacy is closely related to important outcome measures such as subjective well-being[3], functional recovery after hip fracture[4], pain[5], employment outcome from psychiatric rehabilitation[6], coping in patients who had tumor surgery.

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[1] *Bandura A. Social foundations of thought and action: a social cognitive theory. Prentice-Hall, Englewood Cliffs, 1986*

[2] *Rigby SA, Domenech C, Thornton EW, Tedman S, Young CA. Development and validation of a self-efficacy measure for people with multiple sclerosis: the Multiple Sclerosis Self-efficacy Scale. Mult Scler 2003; 9:73-81.*

[3] *Hampton NZ. Subjective well-being among people with spinal cord injuries: the role of self-efficacy, perceived social support, and perceived health. Rehabil Counsel Bull 2004; 48:31-7.*

[4] *Fortinsky RH, Kercher K, Burant C. Measurement and correlates of family caregiver self-efficacy for managing dementia. Aging Ment Health 2002; 6:153-60.*

[5] *Altmaier EM, Russel DW, Kao CF, Lehmann TR, Weinstein JN. Role of self-efficacy in rehabilitation outcome among chronic low back pain patients. J Counsel Psychol 1993; 40:335-9.*

[6] *Regenold M, Sherman MF, Fenzel M. Getting back to work: self-efficacy as a predictor of employment outcome. Psychiatr Rehabil J 1999; 22:361-7.*

Numerous self-efficacy scales have been constructed to measure either generalized self-efficacy or self-efficacy specific to a content area.

For the project DEEP we propose a Self-Efficacy Scale to measure general self-efficacy.

It is composed by 20 items. Each item is rated on a 5 point scale ranging from strongly disagreed to strongly agree. The range for a total score is 20 to 100.

Some statements measures general self-efficacy; other statements measures social self-efficacy, in terms of efficacy expectancies in social situations (Sherer, et al., 1982).

INSTRUCTIONS:

This questionnaire is part of the DEEP Project. The project aims to create a training model that can increasingly encourage the innovative use of 3D printers in the world of disability by bringing together the knowledge and skills of professionals from formally distant fields. One of the phases of the project is field experimentation involving people with disabilities and the various professionals trained to make prototypes through the use of the 3D printer.

One of the project outcome for the people involved in the implementation phase is the increase sense of selfefficacy through active participation in the design and creation of aids.

This questionnaire is a series of statements about your personal attitudes and traits. Each statement represents a commonly held belief. Read each statement and decide to what extent it describes you. There are no right or wrong answers. You will probably agree with some of the statements and disagree with others. Please indicate your own personal feelings about each statement below by marking the itumber that best describes your attitude or feeling. Please be very truthful and describe yourself as you really are, not as you would like to be.

MARK:

1 = If you DISAGREE STRONGLY with the statement

2 = If you DISAGREE MODERATELY with the statement

3 = If you neither agree nor disagree with the statement

4 = If you AGREE MODERATELY with the statement

5 = If you AGREE STRONGLY with the statement

	1	2	3	4	5
1. I can always manage to solve difficult problems if I try hard enough					
2. I am certain that I can accomplish my goals.					
3. I can keep my disability condition from interfering with family relationships					
4. I am confident that I could deal efficiently with unexpected events					
5. I can keep the emotional distress caused by my disability condition from interfering with the things I want to do					
6. Thanks to my resourcefulness, I know how to handle unforeseen situations.					
7. When trying to learn something new, I don't give up early even if I am initially unsuccessful.					
8. I can keep the fatigue caused by my disabilty condition from interfering with the things I want to do					

9. I can solve most problems if I invest the necessary effort					
10. I can remain calm when facing difficulties because I can rely on my ability to cope with different situations.					
11. When I am confronted with a problem, I can find several solutions					
12. I can keep my disability condition from interfering with my ability to interact socially					
13. If I am in trouble, I can think of a good solution					
14. I can keep my disability condition from interfering with having a fulfilling life					
15. When I set myself important goals, I tend to achieve them.					
16. I give up on things before completing them					
17. I can keep my disability condition from interfering with friendships					
18. I cope with the difficulties I may encounter in life.					

19. I can keep my disability condition from interfering with my ability to deal with unexpected events					
20. I feel confident in my ability to do things.					

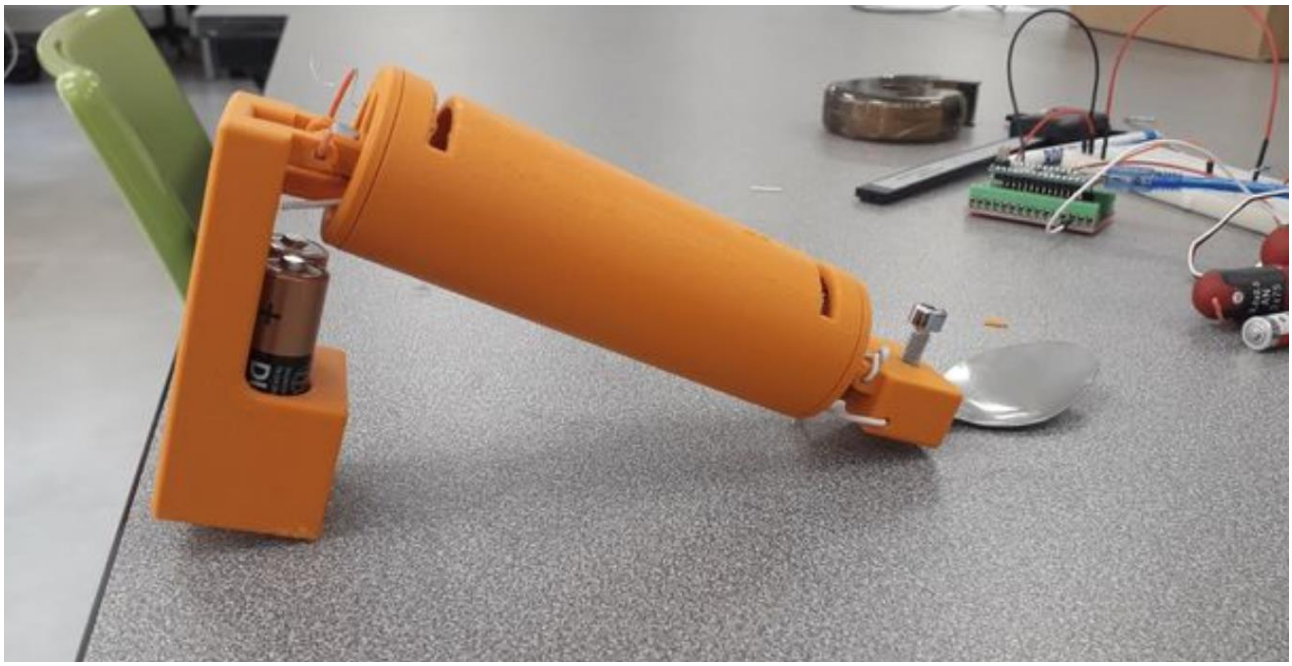
ANNEX VI

Evaluation questionnaire on basic knowledge and skills regarding the use of the 3D printer

For each of the following assistive technology, please answer the following questions:

1) Can the aid or some parts of the aid be 3D printed ?
2) Which material is needed ?
3) Which further rapid prototyping technologies are involved ? e.g. lathe, milling, CNC, laser cutting,...
4) Is any electronics involved ? e.g. Arduino, sensors, micro-switches...
5) Is any software/coding involved ?
6) How easy is the production of this aid ?
7) Can you estimate the time needed to make it ?
8) Can you estimate the cost ?

Anti-tremor spoon



1) Yes ☐
   No ☐

2) Please list all material needed:

---

3) Please list the further technologies used:

---

4) Yes ☐
   No ☐

If yes, please describe: ---

---

5) Yes ☐
   No ☐

If yes, please describe: ---

---

6) Easy ☐
   Average ☐

Difficult ☐
Very difficult ☐

7) Less than 8 hours ☐
8-16 hours ☐
16-32 hours ☐
More than 32 hours ☐

8) Less than 50 Euros ☐
50-100 Euros ☐
100-200 Euros ☐
More than 200 Euros ☐

Motorised headrest for wheelchair

1) Yes ☐
No ☐

2) Please list all material needed:

---

3) Please list the further technologies used:

---

4) Yes ☐
No ☐

If yes, please describe: ----------

---

5) Yes ☐
No ☐

If yes, please describe: ----------

---

6) Easy ☐
Average ☐
Difficult ☐
Very difficult ☐

7) Less than 8 hours ☐
8-16 hours ☐

16-32 hours ☐
More than 32 hours ☐

8) Less than 50 Euros ☐
50-100 Euros ☐
100-200 Euros ☐
More than 200 Euros ☐

Visual alarm for deaf people

1) Yes ☐
No ☐

2) Please list all material needed:

---

3) Please list the further technologies used:

---

4) Yes ☐
No ☐

If yes, please describe: ---

---

5) Yes ☐
No ☐

If yes, please describe: ---

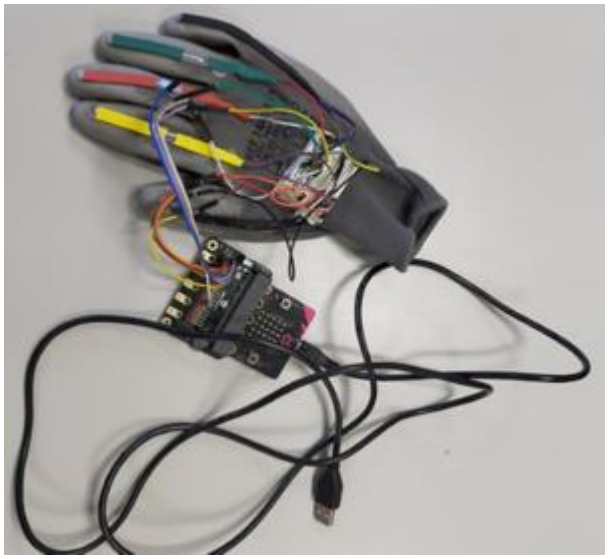
---

6) Easy ☐
Average ☐
Difficult ☐
Very difficult ☐

7) Less than 8 hours ☐
8-16 hours ☐
16-32 hours ☐
More than 32 hours ☐

8) Less than 50 Euros ☐
   50-100 Euros ☐
   100-200 Euros ☐
   More than 200 Euros ☐

Hand orthosis



1) Yes ☐
   No ☐

2) Please list all material needed:

---

3) Please list the further technologies used:

---

4) Yes ☐
No ☐

If yes, please describe: ----------

---

5) Yes ☐
No ☐

If yes, please describe: ----------

---

6) Easy ☐
Average ☐
Difficult ☐
Very difficult ☐

7) Less than 8 hours ☐
8-16 hours ☐
16-32 hours ☐
More than 32 hours ☐

8) Less than 50 Euros ☐
50-100 Euros ☐
100-200 Euros ☐
More than 200 Euros ☐

Mouse with adapted scroll

1) Yes ☐
   No ☐

2) Please list all material needed:

---

3) Please list the further technologies used:

---

4) Yes ☐
No ☐

If yes, please describe: ---

---

5) Yes ☐
No ☐

If yes, please describe: ---

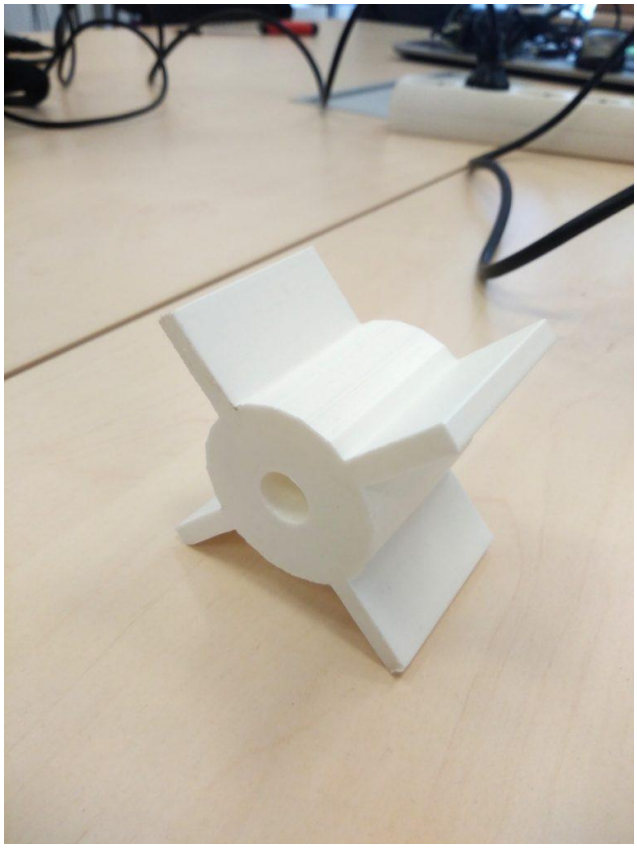
---

6) Easy ☐
Average ☐
Difficult ☐
Very difficult ☐

7) Less than 8 hours ☐
8-16 hours ☐
16-32 hours ☐
More than 32 hours ☐

8) Less than 50 Euros ☐
50-100 Euros ☐
100-200 Euros ☐
More than 200 Euros ☐

Adapted faucet



1) Yes ☐
No ☐

2) Please list all material needed:

---

3) Please list the further technologies used:

---

4) Yes ☐
No ☐

If yes, please describe: ----------

---

5) Yes ☐
No ☐

If yes, please describe: ----------

---

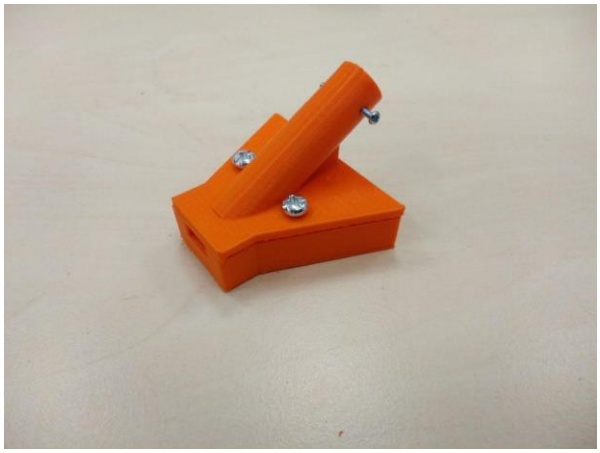
6) Easy ☐
Average ☐

Difficult ☐
Very difficult ☐

7) Less than 8 hours ☐
8-16 hours ☐
16-32 hours ☐
More than 32 hours ☐

8) Less than 50 Euros ☐
50-100 Euros ☐
100-200 Euros ☐
More than 200 Euros ☐

Inserting device for charging cable



1) Yes ☐
No ☐

2) Please list all material needed:

---

3) Please list the further technologies used:

---

4) Yes ☐
No ☐

If yes, please describe: ---

---

5) Yes ☐
No ☐

If yes, please describe: ---

---

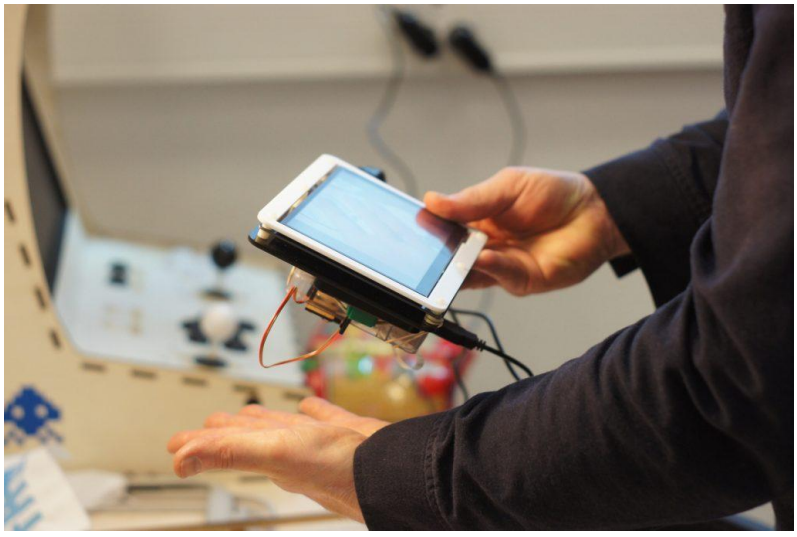
6) Easy ☐
Average ☐

Difficult ☐
Very difficult ☐

7) Less than 8 hours ☐
8-16 hours ☐
16-32 hours ☐
More than 32 hours ☐

8) Less than 50 Euros ☐
50-100 Euros ☐
100-200 Euros ☐
More than 200 Euros ☐

Simplified camera



1) Yes ☐
No ☐

2) Please list all material needed:

---

3) Please list the further technologies used:

---

4) Yes ☐
No ☐

If yes, please describe: ---

---

5) Yes ☐
No ☐

If yes, please describe: ---

---

6) Easy ☐
Average ☐
Difficult ☐
Very difficult ☐

7) Less than 8 hours ☐
8-16 hours ☐
16-32 hours ☐
More than 32 hours ☐

8) Less than 50 Euros ☐
50-100 Euros ☐
100-200 Euros ☐
More than 200 Euros ☐

Button mouse

1) Yes ☐
No ☐

2) Please list all material needed:

---

3) Please list the further technologies used:

---

4) Yes ☐
   No ☐

If yes, please describe: ---

---

5) Yes ☐
   No ☐

If yes, please describe: ---

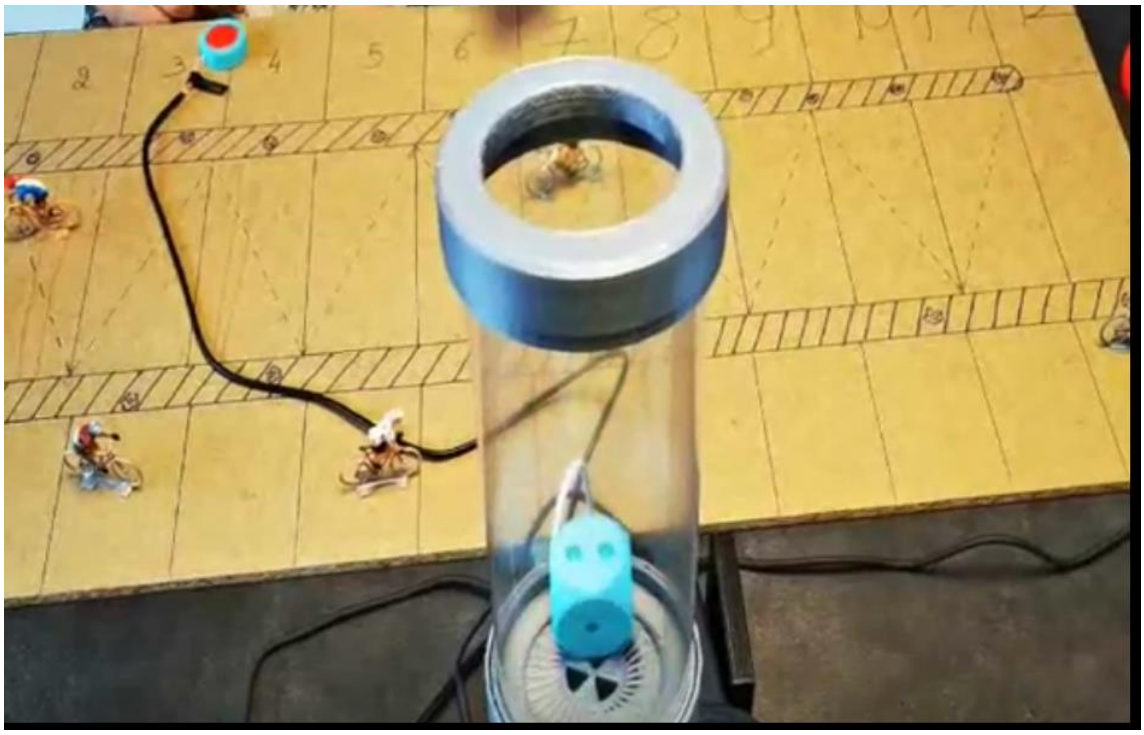
---

6) Easy ☐
   Average ☐
   Difficult ☐
   Very difficult ☐
7) Less than 8 hours ☐

8-16 hours ☐
16-32 hours ☐
More than 32 hours ☐

8) Less than 50 Euros ☐
50-100 Euros ☐
100-200 Euros ☐
More than 200 Euros ☐

Dice thrower



1) Yes ☐
No ☐

2) Please list all material needed:

---

3) Please list the further technologies used:

---

4) Yes ☐
No ☐

If yes, please describe: ---

---

5) Yes ☐
No ☐

If yes, please describe: ---

---

6) Easy ☐
Average ☐
Difficult ☐
Very difficult ☐

7) Less than 8 hours ☐
   8-16 hours ☐
   16-32 hours ☐
   More than 32 hours ☐

8) Less than 50 Euros ☐
   50-100 Euros ☐
   100-200 Euros ☐
   More than 200 Euros ☐