BABEŞ-BOLYAI UNIVERSITY
DEPARTMENT OF PSYCHOLOGY AND EDUCATIONAL SCIENCES
DOCTORAL SCHOOL OF APPLIED COGNITIVE PSYCHOLOGY

PEDonline-a Multi-method and Multi-informant computerized solution for the evaluation of children and adolecents

-Summary-

Ph.D coordinator: Ph.D student:
Prof. Univ. Dr. Mircea Miclea   Bălaj Teodora Anca

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Short summary

In this research study we aimed at conducting an applied industrial research that develops an online assessment platfom for children and adolescents. Delivering assessment services through online methods can overcome the barriers that prevent people to have access to psychological services. This paper has two major aims: 1. Conducting an applied industrial research in the field of computer-based psychological assesment of children and adolescents that develops an online evaluation system starting from Techonology Readiness Level 2 (TRL 2- concept formulation) and reaching TRL 8 (system completed, qualified through test and demonstration). 2. Validating mental health assessment instruments included in PEDonline, which allows the implementation of the online evaluation solution for children and adolescents.

In order to reach the first goal, the following research and development actions are presented: the development of PEDonline, a psychological assessment system for children and adolescents; the functional and usability testing of the system, the evaluation of the system in reference to similar systems, to the Guidelines on Computer-Based and Internet Delivered Testing and a SWOT analysis. For reaching the second goal, three studies were conducted: adaptation of the Early Child Inventory (ECI-4) on Romanian population; adaptation of the school aged Child Symptom Inventory (CSI-4); adaptation of the Adolescent Psychopathology Scale (APS-SF) on Romanian population.

The paper has a number of scientific implications in the technological systems field, as well as in improving the quality of psychological services.

Key words: computer-based assessment, multi-method evaluation, psychological assessment of children and adolescents, online psychological evaluation, developmental assessment of children, school readiness evaluation, mental health evaluation of children and adolescents.

Chapter 1. Theoretical Setting

1.1. General aspects regarding children's mental health

About 450 million people all over the world suffer problems of mental health (OMS, 2001). The same report indicates that one of four people will face a mental health problem at least once in a lifetime. One in five children suffer an emotional, development or behaviour problem, while one of eight has a mental disorder which can be diagnosed clinically (OMS, 2004). From an ontogenetic perspective, childhood is a period of major importance for the prevention of mental health disorders. In fact, mental disorders can be quite accurately identified and diagnosed even in pre-school age. Some disorders have risk factors or antecedents manifested during childhood, even if the disorder becomes clinical or obvious only in teen or adult age. In consequence, it's important to follow the child's development and even resort to specialized treatment, if the case, to prevent chronicization of problems which might later occur in development.

1.2. The importance of tracking mental health problems

Statistics made in the US/Europe suggest approximately one in ten children (according to the National Health Institute, US, 1990) face a mental health problem that seriously affects their functioning. In Romania, certain data are not available, regarding the prevalence of mental health disorders in children and adolescents, but estimates are similar to the ones in Europe and the US. In Great Britain, only a small percentage of children who have mental health difficulties receive specialized help, with estimates between 10 and 21% (Davis, Day, Cox and Cutler, 2000). Similar estimates were recorded for the population of the United States (Perfect and Morris, 2011; Suldo and collab., 2010, in Atkinson and collab., 2014).

Recent studies analyzed the problem of subclinical symptoms in adolescents, pointing out that psychological problems that don't meet the requirements of a diagnosis at the moment of assessment, but show however subclinical symptoms, will eventually evolve in a clinical disorder (Flett and Hewitt, 2013). This fact requires an intervention before the disorder escalates.

1.3. Mental health of children in Romania

Data about the mental health of Romanian children and adolescents are obtained by estimating the mental health disorders from Romania in relation to European and international data (Child and Adolescent Mental Health Policies and Plans, 2005). In 2006, of 4 403 545 children, 20% faced mental health problems or disorders. 13% faced anxiety disorders (generalized anxiety, social anxiety, fobias, separation anxiety, panic attacks), 5% had ADHD, 4% consumed alcohol and substances, 3.5% had clinical depression, 2% a behaviour disorder, 1% schizofrenia and psychotic disorders, 1 of 500 (0. 2%) had autism and pervasive development disorders.

A 2013 report of the National Centre of Mental Health and Antidrug Squad (CNSMLA) states the fact that the maximum number of children diagnosed who are provided with a minimum package of services, falls between 1% and 5%. Compared to the international level, reports indicate mental health services don't provide accurate diagnosis and have lower addressability.

The problem of child and adolescent mental health falls into the trap of a defective system. Among its major deficiencies are: insufficient focus on prevention, small number of mental health specialists, high number of patients related to the number of specialists and the capacity of the system to support them, the difficulty to create a therapeutic team, the lack of collaboration with the education and child protection systems, the parents' reticence, the long waiting time for mental health services, the reduced time of specialist assessment, explanation and orientation for parents, due to an increased demand (Save the Children, 2010).

1.4. Economic costs of mental health disorders of children and adolescents

The economic impact of mental health disorders is huge and long-lasting. Every year, about 38.2% (164.7 million people) of the population of Europe suffer at least one type of mental disorder, the corresponding economic costs reaching 3-4% of the Gross National Product (GNP) (Wittchen and collab., 2011). Although in Romania, direct costs of mental health problems of children and adolescents are not assessed, they can't be too high since there is poor availability of mental health services. Indirect costs, on the other hand, derived from the drops in productivity of parents of children with mental health disorders, as well as from drops in productivity caused by poor schooling and professional instruction of children with mental health problems, mark an important percentage of total costs (OMS, 2001). Moreover, low costs of treatment (caused by the lack of therapeutic assisstance) can increase indirect costs through the enhanced duration of untreated disorders and corresponding disabilities.

1.5. Psychological assessment of children and adolescents

In order to ensure efficient remedy or prevention assisstance and treatment, one must first identify the problem a child is facing. It is well-known, in fact, that an early intervention has much bigger chances to reach its full potential before the child's development amasses deficiencies or faults. Correct assessments are considered critical for a proper intervention (American Pediatrics Academy, 2001; National Association of Children Education [NAEYC] and National Association of Specialists in Early Childhood from the Department of Education [NAECS/SDE], 2003).

The standards for assessing children, stipulated by the National Education Goals Panel (NEGP, 2000) underlined several principles still relevant to this day, according to which assessments should: bring benefits to children; be specific to an assessment goal; be reliable, valid and objective; be age-specific, from the point of view of both content and methodology; be linguistically adequate to the level of the person assessed; take into account the fact that parents are an important source of information in the child's assessment; an assessment cannot be used for several goals (Williams, 2008).

1.6. Computerised/online versus pencil-paper assessment

In the case of the parent-informant, different methods (online and pencil-paper), brought equivalent results (Pritchard, Stephan, Zabel and Jacobson, 2017).

Research about fidelity with different methods showed that computerised methods have very good fidelity indicators, at least similar to the pencil-paper methods (Campbell and collab.,

1999). Moreover, comparisons between tests provided through paper-pencil method versus computerised method revealed unsignificant differences of scores (Finger and Ones, 1999).

1.7. Advantages and disadvantages of computerised/online and pencil-paper testing

We live in a digital society where technology is more and more present in dealing with our daily problems. Psychological activities must adapt to the functioning of society and reflect the needs of contemporary world. The need to integrate technology is proven by studies that show advantages of using computerised assessment. The following table summarizes the advantages and disadvantages of online and pencil-paper assessment.

Table 1.1. Advantages and disadvantages of online and pencil-paper assessment

Advantages of online assessment	Disadvantages of online assessment	Advantages of pencil-paper assessment	Disadvantages of pencil-paper assessment
✓ A more accurate and faster rating	✓ **IF** online assessment is used exclusively for a clinical diagnosis, it can provide invalid results	✓ Some subjects with anxiety for technology will prefer this option	✓ Rating requires time and increased attention from the psychologist
✓ Increases the accessibility of psychological assessment services for children and adolescents	✓ It can be inappropriate for subjects with technology anxiety	✓ It can be appropriate for subjects with technology anxiety	✓ Time and travel costs
✓ If he's wrong, the responder can change the answer, without affecting the rating	✓ **IF** online assessment is used exclusively for diagnosis, non-verbal behaviours can't be observed	✓ IF screenings or tests are made in front of the examiner, non-verbal behaviours can be observed	✓ If the responder is wrong, the change of his answer can mislead the examiner about the right answer
✓ It can bring greater openness from the part of the responder	✓ Results can be easily reached by people with no adequate qualifications		✓ The responder can manifest anxiety towards testing
✓ Allows assessment from distance	✓ Possible difficulties for subjects with lower education level or certain psychiatric diagnoses		✓ The person assessed must go to the psychologist's cabinet
✓ The parent, the teacher or any informant can fill in the tests from home	✓ Possible technical difficulties		✓ To avoid coming back again, the client fills in the tests at the cabinet, at the scheduled time
✓ The psychologist can see results in real time, doesn't lose time with rating and entering data into the system			✓ The psychologist must look in the tables of the test coursebook for the interpretation of results

An assessment report is automatically generated, with explanatory charts			✓ The psychologist describes results in the report he realizes
✓ The psychologist can contact the client or relevant informants through videochat or direct e-mail from the application			✓ Sends information from his own mail
✓ People are educated about mental health through information disseminated on an easily accessible site			✓ Only people who have already seen a psychologist have access to information
✓ Better report cost-efficiency			✓ Lower report cost-efficiency

One cannot deny the fact that psychological assessment based on computerised tests has several benefits: reduced time of testing; fast, accurate rating and automatic assessment report; the computerised format (without requiring printed test notebooks) reduces testing costs, increases objectivity in testing, provides access to people from various geographical areas, at various times, gets higher rate of approval from an increased number of people. Still, there are cases when classic assessment is more appropriate: people for whom computerised testing could add as a stress factor, people with lower socio-economical status, people who don't have easy access to the internet.

1.8. Ethical aspects of computerised/online assessment

Psychological testing through internet brought a radical change of the way testing is performed. However, the ethical practice of psychological testing can be affected if moral implications concerning clinicians, clients, examiners, computerised construction of tests are not taken into account. In International Guides regarding computerised and online assessment, the International Commission of Testing (2006) underlines several leading principles to orient the development of computerised and online platforms. Platform developers should: offer hardware and software indications; ensure the online testing system is solid enough to minimize problems that can arise during completion of tests; take into account human characteristics in presenting material through computer or internet (screen resolution, colors used, fonts, instructions, number of items etc.); take into account the adaptation of technical characteristics of tests for disabled people; offer informative support materials (technical support) adapted to the target public; ensure developers' knowledge, skills and ability to use properly computerised/online testing; provide data about psychometric properties of tests; provide proofs of the equivalence of the two application forms, if tests were developed through data gathered by the pencil-paper method; ensure verification of rating accuracy for online administered tests; ensure feedback and adequate interpretation of test results; increase the accessibility of testing for different cultures; explain the necessity of the examiner to supervise the process of test or proof completion; take

into account aspects regarding the authenticity of the examined person or falsification of answers; ensure security of materials and data confidentiality.

1.9. Levels of technological development

Levels of technological development (*technological readiness levels*-TRL) were introduced by NASA at the middle of the 70's, in order to communicate between organizations the status of various technologies. Levels of technological development are defined from 1 to 9. Each technological level describes a stage of development reached by a certain product. The TRL1 level refers to the stage where basic principle can be identified and reported, while scientific research starts to be transposed to applied research-development. The TRL 9 level, which is the most advanced, indicates a complete level of development and testing (the National Science Academy, 2014).

Table 1.2. The levels of technological development according to the European Commission (2014)

TRL 9	Actual system proven in operational environment, in its final form
TRL 8	System complete and qualified (almost all studies are completed)
TRL 7	System prototype demonstration in operational environment
TRL 6	Demonstration of the functionning of the technology in operational context
TRL 5	Technology validated in relevant environment
TRL 4	Technology validated in lab
TRL 3	Experimental proof of concept
TRL 2	Technology concept formulated
TRL 1	Basic principles observed and reported

The use of the technological level has a major contribution in assessing the technological stage of a certain product. Reporting to this scale is extremely important in managing technological systems (Mankins, 2009). The development of computerised/online systems of assessment can be realized by reporting this development to the levels of technological development. The main benefit of taking into account this system of assessment refers to a

clearer appraisal of the technological stage of the system. This appraisal is important both for developers of systems of assessment, in order to identify necessities for further development, and for users that can analyze and decide upon the validity of data provided by the given system.

1.10. The need to increase children and their family's access to services of psychological assessment

The completion of a computer-based assessment is meant to eliminate families' reluctance to resort to mental health services. The advantages of using computerised assessment services are felt both by families and implicitly by the assessed child, and by specialists who can provide faster and more efficient assessment services:

- First of all, a greater number of people can have access to specialized psychological assessment, thus reducing the number of children who don't receive a mental health intervention, although they would need one.
- Second, assessment through an easily accessible site, where various resources and specialty articles for parents are regularly posted, can support mental health education for a large number of people.
- Third, the use of this type of assessment can reduce certain problems like: the lack of a cultural stimulus for resorting to a psychologist, costs, geographical isolation.
- Fourth, specialists have access to validated assessment instruments, calibrated on the Romanian population, which work on almost any aspect concerning children's development and mental health.
- Fifth, costs associated with this assessment time are significantly lower than costs of exclusively face-to-face assessment.
- Sixth, tests can be filled in from home, any time of day or night.
- Seventh, the specialist can see in real time the test results, doesn't have to rate them or introduce any quota in the system.
- Eigth, all data are stored in the system, which eases the psychologist's work of recording.
- Ninth, the psychologist can generate a quantitative report, with rough scores, T scores, percentile, but also charts enabling him to explain clients the results in a more efficient manner.

Internet searches of information about health has accelerated. The users' ability to access information about physical and mental health will produce changes in the delivery of health services. Globally, 4.5% of all internet searches concern health (Morahan-Martin, 2004).

Chapter 2. Objectives of research

In order to improve psychological services accessibility and ensure early identification of possible problems faced by the child, we set the general objective of achieving an applied industrial research, in support of developing a platform of online psychological assessment of children and adolescents. The present paper sets two main goals:

1. Achieving an applied industrial research in the domain of computerised online assessment of children and adolescents, with the view of developing an online assessment

system (PEDonline) starting from the TRL2 level of psychological development (namely the formulation of the technological concept) to reach the TRL8 level (namely, complete technology, comprising mainly of achieved and demonstrated testing studies).

2. Validating on Romanian population certain instruments of mental health assessment, integrated in the PEDonline platform, which enable to implement the solution of computerised online assessment of mental health state of children and adolescents. According to the stated goals of research, the present paper is structured as follows:

In order to achieve the first objective, research-development activities (described in chapter 3) were performed, according to the following stages:
- Development of the PEDonline platform of psychological assessment of children and adolescents;
- Functional testing and appraisal of the PEDonline platform usability;
- Analysis of the PEDonline platform – in relation to similar platforms and to leading principles for computerised and online assessment.

In order to achieve the second objective, three studies are described in chapter 4:
- Adapting the Questionnaire of Child Assessment- 4 (ECI-4) to the Romanian population - a preliminary report;
- Adapting the Questionnaire of School Children Assessment -4 (CSI-4) to the Romanian population;
- Adapting the Scale of Adolescents Psychopatology Assessment (APS-SF) to the Romanian population.

Chapter 3. Development, testing and evaluation of the PEDonline platform

3.1. Development of PEDonline platform for psychological assessment of child and adolescent

3.1.1. Working definition

The working definition from which we started the development of this online child and adolescent assessment system is a computerized/online application, which:
- ✓ serves explicitly the psychological assessment of child and adolescent;
- ✓ uses the evaluation principals from developmental psychology, cognitive and neuroscience;
- ✓ it is a part of the evaluation process and not a clinical evaluation *per se*;
- ✓ compiles the data obtained from the informants with the date obtained from face-to-face tests or clinical observation;
- ✓ allows the specialist (psychologist) to detain control over the steps and instruments of the assessment.

3.1.2. Design principals of computerized/online platform of psychological evaluation

Starting from the research done in cognitive psychology, developmental psychology and neuroscience, we highlighted several principles on which the computerized evaluation system has been developed.

- *multi-methods* and *multi-informants* assessment is the golden standard in the child psychological assessment (Denham, 2007).
- **the evaluation** using different methods and **multiple steps (multistage)** is used in evidence-based practice. Studies show that clinical psychologists who use one single method of evaluation, in order to obtain information regarding patients, often end up with erroneous conclusions (Fennig, Craig, Tanenberg-Karant and Bromet, 1994).
- the computerized evaluation platform must be **adapted to the users' needs and skills.**
- the platform must allow the generation of a **computerized evaluation report**, in which the quantitative data and the results are graphically presented in an easily understandable manner.
- fourthly, the platform must allow the **current and longitudinal evaluation** of child and adolescent development.
- computerized evaluation must be an **integrative solution** for assessing child and adolescent development. The platform should also function as a tool of integration, data management and gathered information (Miclea et al., 2010).
- **the solution of computerized evaluation must create a community of practice and learning**. Through the computerized evaluation platform it is desired a collaboration between both psychologist-parent-teacher, and from a specialist to another, in order to learn and share knowledge (Miclea et al., 2010).
- for a better use, a computerized platform must be user-friendly (Denham, Bassett and Zinsser, 2012).
- the system must be able to withstand **multiple evaluations**, allowing the obtained data to be stored for a long time.
- the solution must allow the **integration of the evaluation results together with the primary intervention.**
- the chosen *software* must be one with an **intuitive interface** dedicate to various categories of users.
- in addition, the system must have a high degree of motility because it has **to be responsive to constant upgrades.**

Stage of technological development

The analysis of the principles of computerized psychological evaluation of children and adolescents, and the starting point of realizing an application that integrates principles derived from the specialty literature, corresponds to the level of technological development 2 (TRL2). This is the starting point of the present applied research.

3.1.3 Description and relationships between users

The main user of the platform is the **psychologist**. The other users have the role to facilitate the gathering of information related to the case. The psychologist decides the necessity of the evaluation, the tests that need to be performed, who is the informant, and the steps that need to be followed by the participants during the evaluation. At the end of the

evaluation, the psychologist corroborates all the data and writes the psychological report. Therefore, the psychologist is the main user of the tool, but in order to perform the evaluation, he needs information from the parent, teenager and educator.

The psychologist gathers relevant information for the evaluation from:

Parent/tutor

Adolescent/ child

Educator
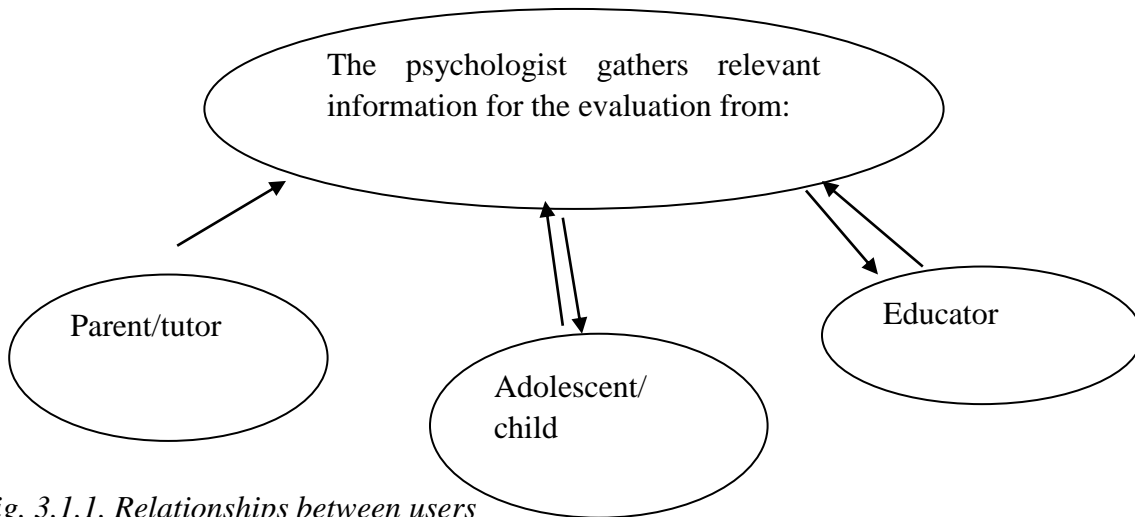
Fig. 3.1.1. Relationships between users

3.1.4. What is the content of PEDonline?

3.1.4.1. Evaluation instruments

- ✓ **Assessment of school preparation throughout evaluating the general level of development (3-7 years old)** - 36 screening scales through which are assessed the cognitive, social, emotional and motor competences, children personal autonomy, and pre-requirements of schooling; the scales are addressed to both parents and educators; fill in online.
- ✓ **Assessment of neuropsychological level of development (3-12 years old)** - with the help of the 20 tasks for psychological evaluation, the specialist is able to identify specific neuropsychological deficits depicted in five functional fields: attention and executive functions, memory, language, visuospatial processing and sensorimotor functionality; the tasks are made in a form of games, applied face-to-face with the child; the raw data being later introduced to PEDonline.
- ✓ **Assessment of cognitive skills (12-19 years old)** - 24 tasks allow forging the profile of cognitive skills of child/adolescent. The evaluation targets: general learning skills, verbal skills, numeric skills, shape perception skills, spatial skills, functional skills, assessing information skills/reaction speed and decision making skills; the majority of tasks are filled online. Self-report is used in the majority of cases.
- ✓ **Assessment of emotions and behaviours/assessment of mental health (3-19 years old)** - the specialist disposes of more than 15 questionnaires through which are evaluated the most frequent psychiatric disorders depending on the age group of the child (anxiety, depression, exclusion based disorders, tics, pervasive developmental disorders etc.),

disruptive behaviours, coping mechanisms, eating disorders; depending on the child's age, the questionnaires are filled by the parents, adolescents or teacher; fill in online.
- ✓ **Assessment of temperament and personality (3-19 years old)** - six questionnaires can be used depending on the child age and the purpose of the evaluation; depending on the age group, the questionnaires are filled by parents and/or adolescents; fill in online.
- ✓ **Assessment of values and interests (12-19 years old) -** with the help of two evaluation tools an image can be provided regarding the adolescent's professional interests and values related to the context of work. They are very useful tools in the career guidance process; addressed to adolescents; fill in online.
- ✓ **Assessment of learning strategies (8-19 years old)** - it is realised throughout an evaluation instrument with two answer options for different age group: one for 8-13 years old, and one for 13-19 years old. Student learning strategies and school motivation are identified in order to reveal academic problems and to improve school performance; addressed to students; fill in online.

3.1.4.2. Non-psychometric assessment methods

The non-psychometric assessment methods within the platform are: the non-psychometric questionnaire, interview, observation, portfolio, practical task, and the project. These are created by the psychologist depending on the evaluation needs; the non-psychometric questionnaire is filled online by the client; in case of other methods, the evaluation occurs face-to-face and the psychologist uploads the results to the platform, either through video chat (e.g. the interview), or by sending some of the records (e.g. as proof of a practical task).

3.1.4.3. Basic resources and information

This section contains general information such as: a brief description of the evaluation scales and packages included in PEDonline, models of psychological reports, theoretical guidance useful for parents, adolescents, and exercises designed to develop various competences and skills useful to parents, educators, or psychologists.

3.1.4.4. Advance resources and information

This section includes advanced information for PEDonline users. Resources can be accessed only based on a *tokenID* received by the parent user once registered on the platform. Are included theoretical references useful for specialists and parents, but as well exercises for developing competences.

Stage of technological development

According to the levels of technological development, the establishment of components integrated into the platform is part of the third level (TRL3). Within it begins active development, and the components start to be assembled. Analyses are performed on the

subcomponents, in order to identify if the integration modality of the principals from the previous level is correct (Mankins, 2009).

3.1.5. PEDonline platform functionalities

Below is a table containing the main platform functionalities regarding on the users.

Table 3.1.1. Users functionalities

Functionalities / Users	Account access	Client registration	Create evaluation profile	Evaluation management	Test performing	Evaluation report		Video chat	Evaluation file	Evaluation archive	Resource access
Psychologist	●	●	●	●	●	●	●	●	●	●	●
Parent	●	●			●	●	●	●			●
Educator					●		●	●			●
Adolescent					●			●			●

Note. The adolescent user utilizes the parent's account, does not have a separate account.

3.1.6. Purposes and scenarios of using the PEDonline platform

Depending on the purpose of the evaluation, the assessment tools can be applied online and after, the results are corroborated with the clinical interview, observation, or tasks held face-to-face with the child. In this case, we are referring to a blended evaluation. Also, the evaluation can be performed exclusively online. Depending on the purposes of the evaluation, we can elegy for one of the following options:

1. Assessment of the level of neuropsychological development;
2. Assessment of school preparation;
3. Assessment of mental health;
4. Career counseling assessment;
5. Assessment of learning strategies and school motivation;
6. Self-awareness and personal development;
7. Personalized evaluation.

Stage of technological development

The description of PEDonline platform functionalities from the perspective of each type of user corresponds to levels 4 and 5 (TRL4-5) of technological development. At this stage, the basic components are integrated and tested in the laboratory.

3.2. Functional testing and uses of PEDonline platform

3.2.1. Testing the offline platforms (PEDa and PEDb)

Starting from the principles of use which proved to be useful in the case of the platforms PEDa- Development Evaluation Platform 3-6/7 years old, and PEDb- Development Evaluation Platform 6/7-18 years old- (824 licensed users, from which a part of them sent emails with the difficulties they encountered in use; these feed-backs have been taken into account, and have been found simplified solutions which have been implemented in version 2.0), but also based on the experience gained in developing computerized products, the PEDonline platform was developed between 2012-2013. In the following sections are described its testing procedures.

3.2.2. Functional testing of PEDonline platform

Functional testing represents a test process that ensures the quality of a program. It is part of the *black-box* testing, where the tested scenarios are based on the specifications of the component being tested. The system to be tested is the so called *black-box*, and it can be observed through *input* and *output* behaviors (Krichen, Tripakis, 2004). The functions are tested by building *input* scenarios, and analyzing the *output*. Functionality testing typically describes what a system does for each function (Beizer, 1995).

Typically, functional testing involves 6 steps (Kaner, Falk and Nguyen, 1999):
1. Identifying the functions that we expect to be fulfilled by the program;
2. Creating input data based on functionality specifications;
3. Determining the output based on functionality specifications;
4. Executing tests based on built test scenarios;
5. Comparing the obtained outputs with the expected ones;
6. Verifying the extent to which the application meets the needs of the users.

The platform's functional testing activity took place for a period of 3 months. The testing team consisted of 12 students under the coordination of 4 clinical psychologists. The members of the testing team participated in an initial training session, where the platform's functionalities were presented in detail, as well as the way to carry out the testing activity. The testing was performed on computers with different technical specifications and operation systems (Windows Vista, Windows 7, Windows 8). Also, in the testing process were used the most popular and used web browsers by Romanian users: Google Chrome, Mozilla Firefox, Internet Explorer, Opera. The testing team was divided into 3 groups, according to the three types of platform users: parent, educator and psychologist. The functional testing procedure followed the 6 testing steps mentioned above.

3.2.3. Testing the PEDonline platform in ecological environment

After the functional testing, the ecological environment testing was performed. This took place in two stages:

First stage: the testing was conducted by 4 clinical psychologists who evaluated a total of 15 people – children and adolescents – through the PEDonline platform. The parents and the evaluated children have completed all the evaluation steps through the platform. After completing this testing steps and fixing the identified errors, the platform was used with clients who requested psychological assessments.

Second stage: the testing was conducted by 7 clinical psychologists who used the platform with over 100 clients who requested assessments for their children. The malfunctions were addressed and corrected as they were identified. The evaluators and respondents were asked to email if they encountered any problem regarding the functionality of the platform. They have also been asked to suggest improvements for the platform's functionality. These clients completed a questionnaire evaluating the usability of this platform at the end of the evaluation.

Stage of technological development

Testing the functionality of the PEDonline platform in its prototype form corresponds to level 6 and 7 (TRL6-7) of technological development. In this stage, both functional and ecological testing are investigated. The product starts to be tested in the context for which it was created.

3.2.4. Usability analysis of PEDonline platform

3.2.4.1. Objective

The aim of the research protocol is to obtain, based on standardized evaluation methods and valid statistical analysis practices, empirically based answers to the following questions:

1. What is the usability level of PEDonline platform for parents?
2. What is the usability level of PEDonline platform for psychologists?

Thus, the aim of this pilot study was to test the extent to which the platform meets the needs of both users parent/tutor and the psychologist, in relation with the psychological assessment.

3.2.4.2. Method

3.2.4.2.1. Participants
In the case of the parent user data was obtained from 41 clients. For the psychologist user the data was collected from 44 psychologists, users of PEDonline, out of which 7 are platform users for more than 6 months, and the rest for less than 6 months.

3.2.4.2.2. Procedure
Each parent/tutor user that has undergone an evaluation process through PEDonline, was requested via email to fill in opinions regarding their experience with the software. In the case of the psychologist user, data was collected after they achieved a formation through a webinar for using PEDonline and after having achieved at least one psychological evaluation through this platform.

3.2.4.2.3. Instrument

In this study, System Usability Scale (SUS) was used (Brooke, 1986).

3.2.4.3. Design

Evaluating the usability of the PEDonline platform is done through a post-hoc design with a single measurement, the System Usability Scale (SUS) (Brooke, 1986) completed at the end of the psychological testing by the parent user, and prior to other evaluation methods used by the specialist. For the psychologist user, the usability questionnaire was sent after these users had completed at least one assessment through PEDonline.

3.2.4.4. Data analysis

All data from the questionnaires was completed using an electronic data base in Microsoft Excel 2007. All statistical tests were performed in SPSS 16.0.

3.2.4.5. Results

In the first stage of the analysis the descriptive data of the sample was performed. Parental ages varies between 26-53 years old, with a mean of 39.42 and a standard deviation of 6.31. Among these, 72.5 % were women, and 27.5 % were men. In the case of the psychologist user, the age range vary between 22-52 years old, the mean being 37.15 and the standard deviation reaching 7.23. 13.63 % of the psychologists had less than 2 years of experience in psychological testing, 27.27% between 2-5 years, and 59.09 % over five years of experience.

The fidelity of the scale was investigated using the Alpha Cronbach coefficient. A value of .88 was obtained for this coefficient in the case of parents, and .82 for specialists, indicating a good fidelity of the instrument.

Furthermore, the descriptive statistics of the total score where then calculated for both users, the parent and the psychologist. The vast majority of parents considered the PEDonline platform to possess a high usability, with the mean total score having a value of 85.793, a median of 90.00, and a mode of 100.00, overlapping the maximum scale values. For the psychologist user the results are similar. The mean total score reached a value of 83.69, a median of 87.50, and a mode of 92.50 that approaches the largest scale values.

The distribution of this data was defined by 2 indicators (Sava, 2011): skewness and curtosis.

In the case of the parent user, the skewness has a value of .946, with a standard deviation of .724, and a -1.241 curtosis, with standard deviation of .369. For the psychologist user, the skewness has a value of -.759, with the standard deviation of .702, and -.465 for the curtosis, with the standard deviation of .357. In the case of both users it can be observed that the answer distribution is asymmetric with most parents and psychologists having high scores at this scale.

Subsequently, were investigated all the given answers for each item of the scale. As well, in the case of individual items analysis, the vast majority of parents considered that the PEDonline platform has a high usability. At each and every item, the median and mode overlap the maximum scale values. Also, at each item of the scale, parents have expressed a strong agreement about the claims regarding the benefits, the ease, and satisfaction of using the PEDonline platform.

In the case of the psychologist user, at the individual items analysis it can be seen that the vast majority of psychologists considered that the PEDonline platform has a high usability. At each and every item, the median and mode overlap the maximum scale values.

To allow us to interpret the total usability score and to highlight the results, we divided the range values into three equivalent ranges, which means three levels of usability: low, medium and high. In the table below is presented the percentage distribution of the overall usability reported by parents at these levels:

Table 3.2.13. Percentage distribution on three usability levels of the total score, parent user

	Low level		**Medium level**		**High level**	
	Range values	**%**	Range values	**%**	Range values	**%**
Usability (total score)	*1-33*	**0**	*34-66*	**9.75**	*67-100*	**90.25**

Based on the table above and the Figure 3.2.5, we can say that the vast majority of parents reported a high level of usability. Not even a parent from this sample reported a low level of usability, and only 4 parents reported a medium level of usability.
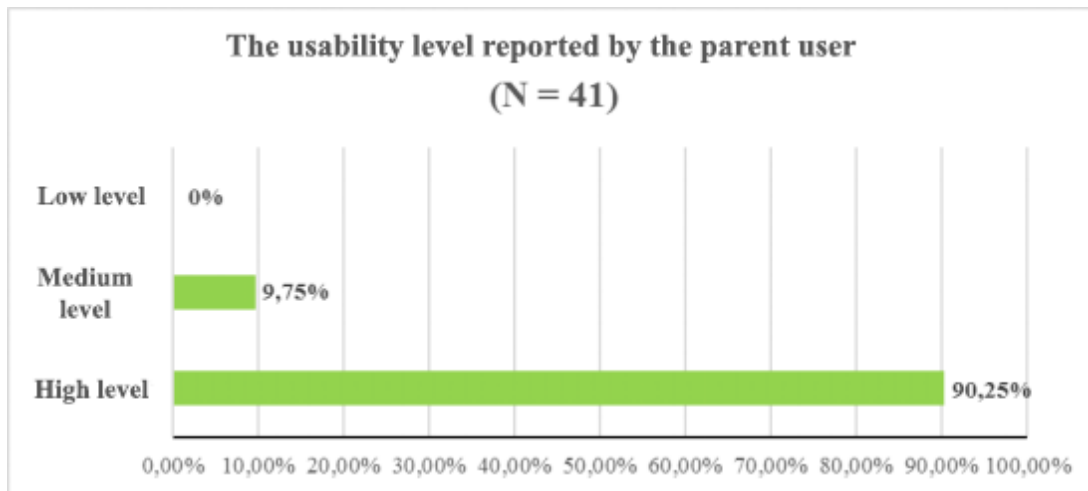
Figure. 3.2.5. Percentage distribution of parents reporting levels of usability

Table 3.2.14. Percentage distribution on three usability levels of the total score, psychologist user

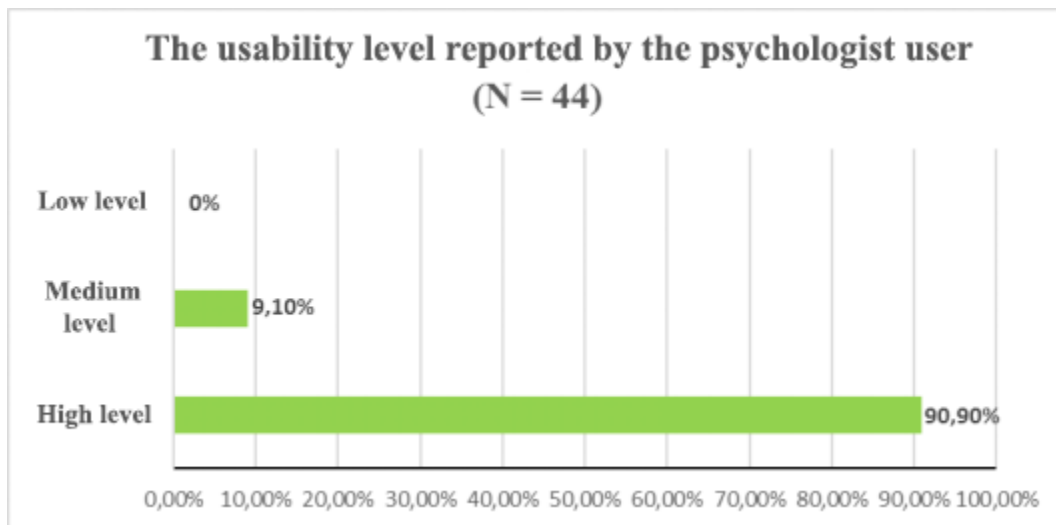|	**Low level**		**Medium level**		**High level**	
	Range values	**%**	Range values	**%**	Range values	**%**
Usability (total score)	*1-33*	**0**	*34-66*	**9.10**	*67-100*	**90.90**

Figure. 3.2.6. Percentage distribution of psychologists reporting levels of usability

As can be seen in the Table 3.2.14 and Figure 3.2.6, a very high percentage of the psychologists that participated in the study (90.90%) reported a high level of usability of the PEDonline platform. A small percentage (9.10%) considered it to have a medium usability, and none (0%) considered it to have a low usability.

3.2.4.6. Conclusions and discussions

The data obtained from this research indicates an increased usability from the parents point of view who have undergone the PEDonline testing process. It is possible to answer the first question of the study, stating that on the studied sample, the parents reported a very high level of usability for the PEDonline platform. Also, it can be noticed an increased usability reported by the psychologist user, thus answering the second question of the study.

The obtained results indicated a high level of usability reported overall by the parent users in 90.25 % of cases (N=41), thus representing 37 parents investigated. Only 4 of them, meaning 9.75 % rated a medium level of usability. In the case of the psychologist users, the results also indicated an increased usability by 90.90% from the investigated psychologists (N=44). Only 9.10 % of them rated a medium level of usability.

3.2.4.7. Limitations and future research

One of the major limitations of this study is that usability was investigated only by the parent user and the psychologist user. No data was provided for the educator user because in this pilot study the sample of educators was too small. For the future, we propose ourselves to realize a usability analysis for all users. The small number of participants in this study (being the case of both users) may be considered as another limitation of the study. However, the data was obtained from the parents who resorted to psychological evaluation services, therefore the platform usability was tested in ecological environment. Continuing the study on a larger number of clients is another purpose of further research. It should be investigated especially to what extent the usability is maintained once with the use of different evaluation purposes of PEDonline. In

the case of this study, due to the small number of participants, no further investigation could be carried out based on the purpose of the evaluation. Another limit of the study is the fact that a large part of the psychologists who participated in the study had less then 6 months of experience in using the platform. Given the fact that the platform was put to use for psychologists from the Romanian market only in the recent months, we couldn't include in the sample enough psychologists with an experience greater than 6 months of using the platform. However, we intent to continue this study on a more experienced sample of specialists.

3.3. PEDonline platform analysis

3.3.1. Comparative analysis of PEDonline with other online platforms

Up next I will briefly describe from a functional perspective, some of the online evaluation platforms that are present in the international market. These platforms will then be subjected to a comparative analysis in respect to PEDonline platform.

In Table 3.3.1. there are synthesized the characteristics of the following international platforms (*CANTAB - Cambridge Neuropsychological Testing Automated Battery, MHS Online Assessment Center, Pariconnect, CogniFit platform for health specialists, CogniFit cognitive evaluation kit of ADHD, CogniFit educational platform, Q-global*). For an easier analysis of these products we put PEDonline in the first column.

Table 3.3.1. Characteristics synthesis of online assessment systems compared to PEDonline

Platform / Characteristics	PEDonline	CANTAB (Cambridge Neuropsychological Testing Automated Battery)	MHS Online Assessment Center	Pariconnect	CogniFit platform for health specialists	CogniFit cognitive evaluation kit of ADHD	CogniFit educational platform	Q-global
Evaluation goals	• Mental health assessment; • Development evaluation; • Preparation for schooling; • Neuropsychological evaluation; • Career counselling evaluation; • Evaluation of learning strategies and school motivation; • Self-awareness and personal development.	• Memory; • Attention; • Executive functions; • Decision; • Emotion and social cognition.	• Emotional intelligence; • Mental health; • Delinquent behaviour; • Attention style.	• Development evaluation; • Intelligence; • Mental health assessment; • Special needs; • Career counselling; • Executive functions; • Personality; • Parental style; • Pain management.	• Cognitive functions evaluation; • Memory; • Attention; • Perception; • Coordination; • Reasoning.	• Cognitive functions evaluation affected by ADHD disorder; • Memory; • Attention; • Perception; • Coordination; • Reasoning.	• Cognitive functions evaluation involved in learning disorders	• Mental health assessment (anxiety, depression, suicide); • Skills evaluation; • Career counselling; • Motor skills, • Interests; • Executive functions; • Parental style; • Intelligence; • Personality.
Children and adolescents evaluation	Yes	Yes	Yes	Yes	Yes	Yes, adults included	Yes	Yes
Age	3-19 years old	4-90 years old	Starting with 2 years old	Starting with 6 years old, adults included	Starting with 6 years old, adults included	Starting with 6 years old	Starting with 6 years old	2-90 years old
Ways of administering the tests	computerized /online	computerized /online	computerized /online or paper and pencil	computerized /online or paper and pencil	computerized /online	computerized /online	computerized /online	computerized /online or paper and pencil
Number of tests	103	27	15	Over 60	20	10	6	55
Users	• Psychologist	• Psycholo	• Psychologist	• Psychologist	• Specialist	• Specialist	• Teacher	• Psychologist

Platform / Characteristics	PEDonline	CANTAB (Cambridge Neuropsychological Testing Automated Battery)	MHS Online Assessment Center	Pariconnect	CogniFit platform for health specialists	CogniFit cognitive evaluation kit of ADHD	CogniFit educational platform	Q-global
	(main user) • Parent • Educator • Child/adolescent	gist (main user)	(main user) • Parent • Educator Child/adolescent	(main user) • Parent • Educator Child/adolescent	(main user) • Evaluated person (child or adult)	(main user) • Evaluated person (child or adult)	(main user) • Student	(main user) • Parent • Educator • Child/adolescent
Assessment through several psychometric methods	Yes	The psychologist decides the tests	The psychologist decides which scale will be completed	The psychologist decides which scale will be completed	The specialist decides which tests will complete the patient	The specialist decides which tests will complete the patient	The educator decides which tests will complete the student	The psychologist decides which samples will be administrated
Assessment through non-psychometric methods	Yes	No	No	No	No	No	No	
Stage evaluation	Yes	No	No	No	No	No	No	No
Longitudinal evaluation	Yes	Yes	Yes	No	No	No	No	No
Combining online evaluation with other data	Yes	No	No	No	No	No	No	No
Electronic evaluation archive	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Communication within the platform by email or video chat	Yes	No	No	No	No	No	No	No
Automatic evaluation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Platform Characteristics	PEDonline	CANTAB (Cambridge Neuropsychological Testing Automated Battery)	MHS Online Assessment Center	Pariconnect	CogniFit platform for health specialists	CogniFit cognitive evaluation kit of ADHD	CogniFit educational platform	Q-global
report								
Export data for analysis	Yes	Yes	Yes	Yes	No	No	No	Yes
Resources included	Yes	No	No	No	Includes clinical intervention packages for cognitive stimulation/ rehabilitation.	Includes clinical intervention packages to stimulate/develop the dimensions affected by ADHD	Includes intervention packages to stimulate/develop learning strategies that can be applied in the classroom.	No

Following the comparative analysis of these existing products, we can draw some conclusions.

Unlike these computerized platforms, the PEDonline platform is superior due to the fact that it integrates the evaluation into several steps, in which each step of the evaluation dictates the other, it integrates multiple assessment methods, both psychometric and non-psychometric, thus providing a clearer image of the evaluated dimensions; the included tasks are specially created for children (see NEPSY) and not some adapted instruments from adults; multiple longitudinal assessments can be made through this platform, either to track the development of competencies, either to measure the results of an intervention, or their stability over time (for follow-up); the evaluation goals included in the platform reflect the most commonly used assessment needs, in case of children and adolescents; the platform includes a large number of tests that the psychologist can use in different combinations; it integrates audio-video communication methods.

3.3.2. Platform evaluation in the light of the recommendations from the International Testing Commission on computerized and online evaluation

In the International Guidelines on computerized and online testing, the International Testing Commission (2006) formulates a series of relevant recommendations for both the developers of computerized/online tests and as well for their users. In the table below are featured the most important recommendations along with the extent to which they are integrated into the PEDonline platform.

Table 3.3.2. Recommendations of the International Testing Commission, integrated in PEDonline

General recommendations	Yes	No
Providing hardware and software specifications;	✓	
Ensuring the sturdiness of the online testing system in order to minimize the problems that may occur while completing the tests;	✓	
Taking into account the human characteristics during the presentation of the material, through the use of computer or internet (screen resolution, used colors, fonts, instructions, number of items, etc.);	✓	
Adapting the technical characteristics of the tests for people with disabilities;		✓
Providing helpful information materials (technical support) tailored to the needs of the target audience;	✓	
Ensuring the needed knowledge and competences for the developers, and the appropriate use of computerized/online testing;	✓	
Considering the psychometric properties of the tests;	✓	
If the tests were developed based on data collected from pen and paper method, evidences must be provided for the equivalence of the two forms of application;		✓

General recommendations	Yes	No
Ensuring the verification of accurate scoring for online tests;	✓	
Providing feedback and appropriate interpretations of test results;	✓	
Increased accessibility of testing for different cultures;		✓
Detailing the need for supervision from the examiner, in the process of completing the tests or tasks;	✓	
Considering the aspects related to the authenticity of the examined person, and falsification of answers;	✓	
Considering the security of materials and privacy of data.	✓	

As it can be noticed, most of the ITC recommendations (2006) are included in the construction and functionality of PEDonline platform. The recommendations that have not been addressed so far, will be the subject of future research studies concerning the platform, its development, and improvement.

3.3.3. SWOT analysis of the PEDonline platform

The SWOT analysis of the PEDonline platform was carried out. As a result, the following were identified:

Strong points:

✓ PEDonline is the only online evaluation system for children aged between 3-19 years old, from the Romanian market;
✓ Serves for multiple evaluation purposes: assessment for the level of development, assessment of school readiness, mental health evaluation, career counselling evaluation, assessment of learning strategies and school motivation, assessment for self-awareness, personal development and personalized evaluation (any other purpose of evaluation for which the tools included may be appropriate);
✓ Comprises over 100 instruments validated and calibrated on the Romanian population;
✓ The psychological evaluation of children and adolescents is a complex process that takes time, sometimes several evaluation meetings, carried out in various interaction schemes. Due to the limited amount of time at their disposal, parents, teachers and the psychologist can obtain maximum efficiency if the questionnaires are completed online;
✓ Tests can be completed from any location (with internet access);
✓ Tests can be completed at any time, the platform is available non-stop;
✓ Data is automatically registered into the platform;
✓ The answers to the tests are rated automatically;
✓ The results can be analyzed by the psychologist at any time;
✓ In case of any doubts or additional discussions the e-mail or video chat can be used, in order to clarify additional aspects with the teacher or with any other informant;
✓ Reduces the number of face-to-face meetings and thus shortens the time needed for the evaluation process;
✓ Increases the accessibility of psychological evaluation services;
✓ Costs are substantially reduced both in terms of needed money, lost time and displacement, fewer evaluation meetings being needed;

✓ The parent receives a detailed psychological report in which are depicted the quantitative results of the evaluation, and also the graphical representations in an easily understandable form. Interpretations of results, conclusions and recommendations are also presented;

✓ The PEDonline platform also represents an instrument for managing the evaluation data;

✓ It allows the integration of a third person in the evaluation (such as a teacher, if appropriate).

Weaknesses:

✓ The platform does not run on Android operating systems.

✓ There are relevant dimensions for the evaluation of children and adolescents, for which there are no scales included: social emotional evaluation in adolescents, parental style, relationship with teachers, attachment, assessment of development, or various aspects relevant for the age group between 0-3 years old;

✓ The tests are not adapted for individuals with disabilities;

✓ The platform can be used for the Romanian population, there are no variants of tests translated into other languages.

✓ The exercises of developing different skills do not have a tested effectiveness through randomized clinical studies;

✓ The tests cannot be filled with pen and paper, in order to later on enter the responses in the software, so that they can be scored (except for the cases of neuropsychological evaluation of development).

Threats:

✓ Practitioners could use this tool as an exclusive way of clinical diagnosis.

✓ Practitioners could send the report automatically via email through the platform, without giving further explanations by face-to-face meetings or video chat.

✓ In the case of cognitive skills evaluation tests, there is a risk that the adolescent will fill them while being tired, after school or at night, which could affect his/her performance.

✓ In case of online testing the reactions of individuals with performance anxiety or with discomfort over technology, are easily detected by the specialist.

Opportunities:

✓ Being the only online evaluation platform in Romania that serves both clinical and educational assessment goals, we expect the platform to be used on a large scale;

✓ By using PEDonline on a large scale for the evaluation of children and adolescents, descriptions can be made on the prevalence of various disorders that affect this population in Romania;

✓ PEDonline can be adapted to work on Android operating systems, being accessible from tablets and mobile phones;

✓ PEDonline can be translated and adapted in various languages in order to be used on a large scale.

Some development directions of the PEDonline Platform resulted from the SWOT analysis

✓ Adapting the platform to work on Android operating systems.
✓ Inclusion of instruments for social emotional evaluation of adolescents, parents' style, relationship with teachers, attachment, etc.;
✓ Introducing the possibility to perform pen and paper testing, and introducing the answers in the platform in order to be automatically ranked;
✓ The platform must be translated in other languages;
✓ Adaptation of tests for the evaluation of people with disabilities;
✓ Developing PEDonline into an instrument of testing and intervention, at the same time, for various child-specific disorders. For this we will develop intervention modules designed to help the parent, the teacher and the psychologist to perform the appropriate intervention.

Stage of technological development

Usability analysis of PEDonline platform, comparative analyses with similar platforms, demonstration of integration and compliance with the recommendations of the International Testing Commission (2006), for computerized and on-line evaluation, and the SWOT analysis are proofs of achieving the level 8 (TRL 8) of technological development. Thus, the product demonstrates its usefulness in the final form and in the operational context for which it was created.

3.4. Scientific contribution

The scientific contribution of this research is both in the field of technological innovation, but also in the field of improving the quality of psychological services. Thereby:

✓ PEDonline is the first system of computerized online evaluation in Romania, through which is realized the psychological evaluation of children aged between 3-19 years old;
✓ It serves multiple evaluation purposes: developmental evaluation, assessment of school preparation, clinical diagnosis, career counselling, assessment of learning strategies and school motivation, self-awareness, and personal development;
✓ Integrates into the platform's functionalities extremely important assessment principles for children's evaluation: multi-user assessment, multi-method evaluation, stage evaluation, and longitudinal assessment;
✓ Provides the possibility of combined use of the evaluation tools through informants and/or self-evaluation, and with cognitive tasks applied face-to-face with the child. Therefore, is possible to realize objective evaluations in contrast to the subjective ones, obtained only by scales completed by the informants;
✓ The PEDonline architecture is innovative, with functionalities adapted to the needs of each user;
✓ Using the online computerized assessment platform of children and adolescents, PEDonline increases the accessibility of children and their families to specialized services of psychological evaluation;

✓   Through PEDonline it is possible to offer specialized psychological services in various fields such as clinical, educational, and career counselling;

✓   The specialists have access to over 100 validated and calibrated instruments of the Romanian population, with which they can offer qualitative and efficient services;

✓   The costs and time required for psychological evaluation are being reduced;

✓   The platform can be used for research purposes (for example, it can be conducted studies to identify the prevalence of mental health disorders in Romania for children and adolescents).

Chapter 4. the Sandardization of Early Childhood Inventory-4, Child Symptom Inventory and Adolescent Psychopatologycal Scale- Short Form on Romanian Population

The main objective of this studies is the validation on Romanian population of mintal health evaluation instruments that are integrated în Pedonline.

4.1.   The Standardization of Early Childhood Inventory-4 (Eci-4) On Romanian Population- A Preliminary Report

4.1.1. Introduction

The Early Childhood Inventory-4 (ECI-4; Gadow & Sprafkin, 2000) is a screening tool for symptoms of behavioral, emotional and cognitive deficiencies of over a dozen of psychiatric disorders specific to childhood. Items in the ECI-4 are based on diagnostic criteria specified in the American Psychiatric Association's (1994) *Diagnostic and Statistical Manual of Mental Disorders* (DSM). ECI-4 facilitates the gathering of information in clinical and educational settings from parents and teachers about the symptoms of early childhood emotional, behavioral and cognitive disorders (Gadow & Sprafkin, 2000). Individual items can be scored in two different ways: the **Screening Cutoff score** method and the **Symptom Severity score** method. The Screening Cutoff score method determines whether or not the symptom occurs often enough to warrant concern. The total number of symptoms rated as being of concern for a specific disorder is then compared with the Symptom Criterion score (i.e., the minimum number of symptoms necessary for the diagnosis of a specific disorder) to determine if the child should be evaluated in greater detail in order to be able to render a diagnosis.

Table 4.1.1. Mental health problems evaluated by ECI-4 Parent and Teacher Checklist

Parent Form	Teacher Form
A ADHD Innatentive Type	**A** ADHD Innatentive Type
A ADHD Hyperactive-impulsive	**A** ADHD Hyperactive-impulsive
A ADHD combined	**A** ADHD combined
B Opozitional Defiant Disorder	**B** Opozitional Defiant Disorder
C Conduct Disorder	**C** Conduct Disorder
PCS *Peer Conflict Scale*	**PCS** *Peer Conflict Scale*
D Separation anxiety -	**-**

E-57 Specific phobia	**E-57** Specific phobia
E-58 Obsessions	**E-58** Obsessions
E-59 Compulsions	**E-59** Compulsions
E-60 Motor tics	**E-60** Motor tics
E-61 Vocal tics	**E-61** Vocal tics
E-62-64 Generalized anxiety	**E-62-64** Generalized anxiety
E-65 Selective mutism	**E-65** Selective mutism
F Major depressive disorder	**F** Major depressive disorder
F Dysthymic disorder	**F** Dysthymic disorder
F Dysthymic disorder (research criteria)	**F** Dysthymic disorder (research criteria)
F77 Adjustment disorder	**F77** Adjustment disorder
G Social phobia	**G** Social phobia
H Sleep disorders	**-**
I. Elimination problems	**-**
J Posttraumatic stress disorder	**J** Posttraumatic stress disorder
K Feeding problems	**K** Feeding problems
L Reactive attachment disorder	**L** Reactive attachment disorder
M Autistic disorder	**M** Autistic disorder
M Asperger syndrome	**M** Asperger syndrome

4.1.2. Aim: The present study aims to adapt, validate and create norms for the Romanian version of ECI-4 and to determine the use of this screening tool for identifying psychiatric problems in children aged between 3-7 years.

4.1.3. Method
4.1.3.1. Participants

A large sample of participants was considered, consisting of both clinical (N=57) and non-clinical populations (N=489). In the clinical sample, all the children had a psychiatric diagnostic already established by a mental health specialist (i.e., psychiatrist, clinician). All this participants were evaluated by two kinds of informants: kindergarten teachers and parents. In the non-clinical sample, the age mean was m=4.65 and the standard error SA= 1.22, and in the clinical sample, m=4.79 and SA=1.54.

4.1.3.2. Procedure

The study consisted of four phases: (1) items forward and back-translation; (2) a pilot study for verification of translated items; (3) determination of validity and reliability and (4) the creation of norms on Romanian population.

4.1.3.3. Measures

* *The Early Childhood Inventory-4* (ECI-4, Gadow & Sprafkin, 2000)
* *Spence Preschool Anxiety Scale* (Spence, 1998) *(Spence Preschool Anxiety Scale;* Spence, 1998).

- *Social Skills Rating System-Preschool level- SSRS (Social Skills Rating System Preschool level - Parent Form, Teacher Form –SSRS;* Gresham și Elliott, 1990).
- *The Childhood Autism Rating Scale (C*ARS; Schopler, Reichler & Renner, 1986)
- *Asperger Syndrome Diagnostic Scale* (ASDS; Myles, Bock & Simpson, 2001)
- *The Behaviour Assessment System for Children, Second Edition* (BASC-2; Reynolds & Kamphaus, 2004)

4.1.4. Data analysis: Data analysis was conducted with SPSS for Windows software (version 13.0).

4.1.5. Results

4.1.5.1. Criterion Validity

For the Screening cutoff score were calculated the sensitivity and the specificity for those disorders identified in the clinical sample. The values obtained for the specificity indexes range from .53 and .95, most of them are above .80. This result means that ECI-4 is a specific instrument if we take into consideration APA norms Taking into account both checklists (for teachers and parents), specificity takes higher values (.84-1.00). Sensitivity reached only modest values in general, between 0.33 și 1.00, probably because in the clinical sample there were few children for each diagnostic, and the values obtained for sensitivity and specificity should be taken into consideration with caution. In the original sample, the specificity and sensibility indexes has been calculated only for the disorders from the clinical sample.

4.1.5.2. Construct Validity

The construct validity has been investigated through Symptom severity score. A comparison among the means of the Symptom severity score between clinical (N=52) and non-clinical (N=95) sample was proceeded. The comparisons were made separately for teacher and parent checklists.

În the clinical sample, parent form, means are between 1.69-24.61, are for the teacher form, means are between 1.16- 22.94. În the non-clinical sample, parent form, means are between .25- 13.84, are for the teacher form, means are between 1.85-13.99. t values, parent form are between .428-7.945, and for the teacher form, are between .537-5.863. The differences between means (*t*) are significant (*p≤ .05*) for the majority of the categories evaluated. A possible explanation for those problems that t values were not significant (as for conduct disorder and separation anxiety from the parent form and conduct disorder and peer conflict scale from the teacher form) could be a small number of participants with these disorders in the clinical sample.

4.1.5.3. Convergent validity

Convergent validity was assessed by establishing the relationship between ECI-4 categories and other instruments that measure similar constructs. The correlation coefficients were processed separately for both parent and teacher forms. Pearson coefficients between Symptom Severity score and other instruments, varied in the medium range. The results of the statistics indicate that in most of the situations, the values of the correlation coefficients are significant at p≤.05. The values of the correlation coefficients are between .37- .81. Taking into account the correlations between M category and the 15 subscales of CARS, only one (i. e., *level of activity*) value of the correlation was not significant at p≤.05. All the significant values of

correlation between ECI-4 categories and the other scales that measure similar constructs sustains the convergent validity of the instrument.

4.1.5.4. Test-retest reliability

Test-retest reliability was measured for both teacher and parent forms of the ECI-4 at a 3 month interval on 40 children from a non-clinical group. Test-retest correlations were in the .66-.97 range for teacher checklist and in the .35-.98 range for parent checklist. In almost all cases, the values of the correlations were significant at p≤.05. In only one situation, elimination problems, the value of the correlation was not significant at p≤.05, probably because during the period between test and retest (3 months) the symptoms might disappear as a consequence of the participants maturization. It can be concluded that both teacher and parent checklist have good test-retest reliability and they are stable measures of the constructs evaluated.

4.1.5.5. Inter-rater reliability

The inter-rater reliability was processed between the two informant sources: parents and teachers in both clinical (N=57, 63.2 % boys and 36.8% girls) and non-clinical (N=489, 50.1% boys and 49.9% girls) samples. The correlation coefficients were processed on Symptom Severity score. For the non-clinical sample the correlations ranged between .21 și .56, and all were significant at p≤.001. In the clinical sample, the correlations ranged between .01-.76, the results indicate that the value of the Pearson correlation coefficients are significant at p≤ .001 for most of the cases. In only two situations (i.e., oppositional defiant disorder and generalized anxiety) the level of agreement between the informants was significant at p≤.05 and in one case (i.e., conduct disorder) the level of agreement was not significant at p≤.05. This result might be a consequence of parents or teachers subjectivity in evaluating the child's behavior or
a consequence of contextual behavior of the child.

4.1.6. Conclusion and discussion

The aim of this study was to adapt, validate and create norms for ECI-4 on Romanian population. ECI-4 has proven to be a reliable and valid tool for assessing psychiatric disorder in children of Romania. All the analyses undertaken regarding the psychometric characteristics of ECI-4 recommend it both for practical and research use. It can be used in the assessment process, research, intervention and follow-up of the treatment. To sum up, ECI-4, parents and teacher checklist show good psychometric properties. Based on these properties, we developed norms for preschool children of the Romanian population. However, there is a need to further evaluate this instrument, especially by further validation studies. The practical implications of our research are most relevant for mental health practitioners. We believe that a consistent evaluation of kindergarden children for psychiatric disorders is needed in order to prevent mental health problems.

4.1.7. Limitations and new research directions

The findings of our study should be considered in the context of some limitations. Firstly, the number of participants in the clinical sample was relatively small and in the sample were not all the disorders evaluated by ECI-4 and as a conclusion we could not determine the sensitivity

and specificity values for all disorders. Therefore those calculated must be interpreted with caution. Secondly, some of the persons in the clinical group might have unspecified associated psychological disorders, which could influence the results we obtained. Although, the results are encouraging.

4.2. The Adaptation of the Child Symptom Inventory-4 (Csi-4) on Romanian Population

4.2.1. Introduction

The CSI-4 Parent Checklist and Teacher Checklist assess the symptoms of the most common childhood emotional and behavioral disorders. In addition, the CSI-4 addresses problems that are noticed in relation to children's daily habits (i.e., eating, sleeping, toilet training), in order to ensure a comprehensive evaluation. CSI-4 facilitates the gathering of information in clinical and educational settings from parents and teachers regarding the symptoms of childhood emotional, behavioral and cognitive disorders (Gadow & Sprafkin, 2002).

4.2.2. Aim: The present study aims to determine the psychometric properties of the Romanian version of CSI-4 and to determine the use of this screening tool for identifying psychiatric problems in children aged between 7-12 years.

4.2.3. Method
4.2.3.1. Participants

Most of the processed statistical data were based on two samples of children, a clinical sample (N=99) and a non-clinical one, the normative sample (N=1066). Children were aged between 7 and 12 years, and the age means were not significantly different, at p<.05, for boys and girls. The gender distribution does not present significant differences between the clinical and the non-clinical samples: χ_{cor}^2 (1)=.029; p=.864. However, the age means between the two samples reflect significant differences: t (112.9) = 3.553; p=.001. The most frequent diagnoses were: separation anxiety, ADHD, posttraumatic stress disorder, autistic disorder, generalized anxiety and conduct disorder.

4.2.3.2. Procedure

The study consisted of three phases: (1) forward and back-translation for the CSI–4 items; (2) a pilot study to check for the correct understanding of the translation; and (3) determining the screening tool's validity and reliability.

4.2.3.3. Instruments

The Child Symptom Inventory-4 (CSI-4, Gadow & Sprafkin, 2002). CSI-4 is a behavior rating scale that screens for the DSM-IV (APA, 1994) emotional and behavioral disorders in

children aged between 7 and 12 years old. The CSI-4 can be scored to derive Symptom Count scores (diagnosis model) or Symptom Severity scores (normative data model).

Table 4.2.3. Mental health problems evaluated by CSI-4 Parent and Teacher Checklist

Parent Checklist	Teacher Checklist

A. ADHD Inattentive Type
   ADHD Hyperactive-Impulsive Type
   ADHD Combined Type
	A. ADHD Inattentive Type
	   ADHD Hyperactive-Impulsive Type
	   ADHD Combined Type

B. Oppositional Defiant Disorder	B. Oppositional Defiant Disorder
C. Conduct Disorder	C. Conduct Disorder
D. Generalized Anxiety Disorder	D. Generalized Anxiety Disorder
E.49 Specific Phobia E.50. Obsessions E.51. Compulsions E.52. Posttraumatic Stress Disorder E.53. Motor Tics E.54. Vocal Tics	E.49 Specific Phobia E.50. Obsessions E.51. Compulsions E.52. Posttraumatic Stress Disorder E.53. Motor Tics E.54. Vocal Tics
F. Schizophrenia	F. Schizophrenia

G. Major Depressive Disorder
   Dysthymic Disorder
	G. Major Depressive Disorder
	   Dysthymic Disorder

H. Autistic Disorder
   Asperger Syndrome
	H. Autistic Disorder
	   Asperger Syndrome

I. Social Phobia	I. Social Phobia
J. Separation Anxiety Disorder	**-**
E.96. Enuresis E.97. Encopresis	**-**

CBCL (Achenbach & Rescorla, 2001). CBCL is a part of Achenbach's System of Empirically Based Assessment (ASEBA). The 113 items evaluate: anxiety/depression, withdrawn/depressed, somatic problems, social problems, cognitive problems, attention problems, rule breaking behavior, aggressive behavior.

4.2.4. Data analysis: Data analysis was conducted with SPSS for Windows software (version 16.0).

4.2.5. Results

4.2.5.1. Preliminary Data Processing

Rank correlation coefficients (Spearman), between the child's age and the symptom severity scores for the CSI−4 scales, were calculated separately for boys and girls, in the non-clinical sample (the normative sample) of the CSI−4 Checklist. Several significant correlations at $p < .05$ were identified, their values ranged from .13-.17.

Gender differences were examined by comparing the average symptom severity scores, for each form of the CSI-4, for boys and girls. The data processing was performed for the

normative sample of the CSI-4 Checklist. For most scales of the Teacher Checklist (13 of 18) and for over a third of the scales of the Parent Checklist (8 of 21), the average scores are significantly different, at p<.05, for boys and girls. The fact that most of the scales of the CSI–4 symptom severity scores vary according to gender and age, when score means are compared, suggests that the used samples should reflect similarities in relation to the gender and the age of the included children.

4.2.5.2. Reliability

4.2.5.2.1. Internal consistency

The α (Cronbach) coefficient was calculated for each scale, in the non-clinical sample of the CSI–4 Checklist (N=1066). Results showed that more than a half of the coefficients are higher than .70 (14 out of 24 from the teacher form and 21 out of 26 from the parent form), and only 3 coefficients are smaller than .60 (two from the teacher form and one from the parent form). The smallest values were obtained for the Schizophrenia scale, probably as a consequence of the various manifestations of the symptoms of this disorder at this age.

4.2.5.2.2. Test-retest reliability

The CSI-4 was administered twice, at a two month interval, to a number of 42 children, for the Teacher Checklist and 63 children for the Parent Checklist. The correlation values between test and retest for the teacher form ranged from .28-.96, and for the parent form, .07-.92. It is clear that, for most scales, significant values of the correlation coefficients were obtained, at p<.05 (generally, at p<.001) and the value of the correlation coefficients are moderate to high, except for the Compulsions scale, for the Teacher Checklist, and the Schizophrenia scale, for the Parent Checklist. It is also important to mention that, for most scales, the t values are not significant at p>.05. We can conclude that CSI-4 reflects a good stability over time of the screening results.

We also proceeded at the analysis of the test and retest scores, for the Cutoff scores, with the help of the McNemar test. We employed the same samples. For both forms of the CSI-4, the relative frequency of the children with the same Cutoff score on both testing occasions was, for all scales, over .72. The scores distribution is not significantly different (at p<.05) between test and retest, except for the Obsessions scale, from the Parent Checklist. For this particular scale, on test, the score of 1 was predominant (35 people of 61), while on retest, a score of 0 was predominant (37 people of 61). Given these results, one may conclude that CSI-4 shows a good stability over time.

4.2.5.2.3. Inter-rater reliability

In order to determine the degree of compliance between the two forms of the CSI-4, linear correlation coefficients were calculated for the symptom severity scores, between the two forms. The calculations were performed in the non-clinical sample, (N=1066) and in the clinical sample (N=99). The correlation coefficients ranged from .11-.95, and were significant at p<.001 for most of the disorders screened by both forms of the CSI-4. Only one coefficient was insignificant, for the Conduct Disorder, girls, non-clinical sample.

For each scale, we then calculated the Φ coefficient, in order to study the relation between the Cutoff scores provided by parents and teachers. With one exception (the Dysthymic

Disorder scale, in the non-clinical sample), all Φ coefficient are significant at p<.001. In the non-clinical sample, in the case of the Dysthymic Disorder scale, all children with a "yes" value of the Cutoff score in one form of the checklist, had a "no" value of the Cutoff score in the other form of the checklist. In the non-clinical sample, the Φ coefficients had lower values, between -.01 and 0.36. In the clinical sample, the values of the Φ coefficients were higher, between .53 and .81. One may conclude that, when clinical manifestations are present, there is a high agreement between the ratings performed by the parents and teachers, probably because, by observing the manifestation of the symptoms, they can identify them more accurately.

4.2.5.3. Validity

4.2.5.3.1. Criterion validity

The specificity index, the sensitivity index, the positive predictive value and the negative predictive value were calculated for the four disorders that were diagnosed in at least 12 people from the clinical sample, made of 99 children: separation anxiety (31 children), ADHD (17 children), posttraumatic stress disorder (17 children) and autistic disorder (12 children). The specificity index takes values between .94 and 1.00 for teachers and between .89 and 1.00 for parents. for most analyzed disorders, the APA requirements (1985) are met.

For all the analyzed scales, the negative predictive value is very good (over .97). The positive predictive value is under 50 for all scales, except for the Autistic Disorder scale, which means that for each disorder, among all those who have a "yes" value of the Cutoff score, less than half of the children really suffer from that disorder. However, for each disorder the PPV is much higher than the relative frequency (expressed in percentage) of the disorder in the sample used for the calculations. In other words, the percentage of the children who were diagnosed with one disorder is higher among those who have a "yes" value of the Cutoff score than the entire sample. In the original sample, the sensitivity and specificity indexes are in the same rage with our findings.

4.2.5.3.2. Construct validity
Study 1

We wanted to see if the symptom severity scores of the children diagnosed with a disorder that was screened by CSI-4 were higher than those of the children without a psychiatric diagnosis. For the comparison of the means of the symptom severity scores we used the clinical sample, consisting 99 children with various clinical disorders, and a paired non-clinical sample.

The results showed that, for almost all the subscales, means were significantely different at p ≤ .05. The only scale for which the means do not differ significantly at p ≤ .05 is Encopresis, parent form. The means are higher in the clinical sample than in the non-clinical one. For the teacher form, means differences range from t=4.07-18.87, and for the parent form t=.81-17.11. Differences between means (t) are significant (p≤.001) for almost all of the scales. The same results were obtained for both informants (teacher or parent) in the Romanian and the American sample. Consequently, CSI-4 discriminates between the clinical and non-clinical sample.

We proceed this kind of comparisons for the separation anxiety (for the other disorders we could not do such analysis due to a small number with other disorders from the clinical sample.) In the clinical sample, there were 31 children (24 girls and 7 boys), aged between 7 and 11 years (m=8.23; σ=1.18), with a diagnosis of "separation anxiety". They formed the clinical sample. A pair sample was then created, for each child from the clinical sample a child of the same age and

gender was extracted arbitrarily from the non-clinical sample of the CSI-4. The means of the symptom severity score were then compared for both samples, using the 2-tailed t test for paired samples.

For the teacher forms, the mean differences ranged from t=1.14-15.23, and for the parent form, t=.00-12.17. With the exception of the ADHD Attention Deficit Type (both checklists), ADHD Combined Type (Parent Checklist), Vocal Tics (both checklists), Enuresis (Parent Form) and Encopresis (Parent Checklist) scales, the means are significantly different, at p<.05, between the group of children with separation anxiety and the children without any psychiatric diagnosis. The means are higher for the children with separation anxiety; therefore, the test discriminates between the children with this diagnosis and those without one.

Study 2

A factor analysis of the scales was performed for both forms of the CSI–4, in the non-clinical sample of the CSI-4 (N=1066). The Principal Component Analysis was used. The factors were rotated with the Varimax method. The symptom severity scores were then processed. In the case of the Teacher Checklist, four factors were extracted, which cover 64.88% of the total variance: (F1: 22.70%; F2:16.41%; F3:14.31%; F4:11.46%), while in the case of the Parent Checklist, five factors were extracted, which cover 65.55% of the total variance: (F1: 16.69%; F2:15.98%; F3:12.90%; F4:11.95%; F5:8.03).

The following conclusions were drawn for both forms of the CSI–4: the scales that screen the three types of ADHD and the Oppositional Defiant Disorder scale show the highest saturation in the same factor (F1 factor); the Generalized Anxiety, Major Depressive Disorder and the Dysthymic Disorder scales have the highest saturation in the same factor (F2 factor); the Specific Phobia, Obsessions, Compulsions and Posttraumatic Stress Disorder scales have the highest saturation in the same factor (F4 factor); in the case of the Parent Checklist, the Social Phobia and Generalized Anxiety scales also have the highest saturation in the same factor; the Autistic Disorder and Asperger Syndrome scales have the highest saturation in the same factor (in the F3 factor for the Teacher Checklist and in the F2 factor for the Parent Checklist). One may notice a different charge of the factors according to the type of disorder present. Mostly, there is a charge on the same factor by the disorders that share similar symptoms, e.g., ADHD and oppositional defiant disorder, on F1 or the charge on F2 of the generalized anxiety together with the major depressive disorder and the dysthymic disorder, all pertaining to the category of internalizing disorders. These results support the construct validity of the instrument.

4.2.5.3.3. Convergent Validity

In the process of researching the concurrent validity, we analyzed both the convergent and the discriminant validity. In this study, the convergent and discriminant validity were analyzed by correlating the CSI-4 parent checklist symptom severity scores with the Child Behavior Checklist Parent Form scales (CBCL; Achenbach & Rescorla, 2001). The sample consisted of 65 children (21 boys and 44 girls) aged between 7 and 12 years (m=10.48; σ=1.40), pertaining to a non-clinical population.

The obtained correlation coefficients were significant at p<.05, for most scales that screen for similar constructs, while the correlation coefficients were low or even not significant at p ≥ .05 for most scales that screen for different constructs. More specific, scales that measure similar

symptoms have a higher value of the correlation coefficient, meanwhile scales that measure not similar symptoms, had low or insignificant correlation value. The results obtained in the investigation of the relations between CSI-4 and CBCL support both the convergent validity and the discriminant validity of the CSI-4 Parent Checklist.

4.2.6. Conclusions and discussions

Our aim was to adapt the CSI-4 on Romanian population. CSI-4 has proven to be a reliable and valid tool for assessing psychiatric disorders in the Romanian children. All the analyses undertaken regarding the psychometric characteristics of CSI-4 recommend it for both practical and scientific use. However, there is a need to further evaluate this instrument, especially by further validation studies. The results obtained on the Romanian sample are similar with those obtained on the American sample, with some exceptions, e.g., the comparison of the means of the severity scores between boys and girls on Parent Checklist, probably due to a better understanding of the American parents of the mental health issues. However, the fidelity and validity coefficients are for almost all the analyzed data, in the same range.

The practical implications of our research are most relevant for mental health practitioners. We believe that a consistent evaluation of children for psychiatric disorders is needed in order to prevent mental health problems. As a consequence, the aim of screening is rather promoting an early detection and intervention in such cases.

4.2.7. Limitations and new research directions

The findings of our study should be considered with some limitations. Firstly, the number of participants included in the clinical sample was relatively small; the sample did not include all the disorders evaluated by CSI-4 and we could not determine the sensitivity and specificity values for all disorders. Therefore, the ones that were calculated must be interpreted with caution. Secondly, some participants from the clinical group might have suffered from unspecified associated psychological disorders, which could have influenced our results. For this reason, our research endeavors are and must be continued with additional studies and data collection.

For all the analyzed scales, the negative predictive value is very good (over .97), but the positive predictive value is under 50 for all scales. However, for each disorder the PPV is much higher than the relative frequency (expressed in percentage) of the disorder in the sample used for the calculations. In other words, the percentage of the children who were diagnosed with one disorder is higher among those who have a "yes" value of the Cutoff score than the entire sample.

4.3. The Adaptation of Aps-sf nn the Romanian Population

4.3.1. Introduction
The Adolescent Psychopathology Scale – Short Form (APS-SF) was designed to evaluate the psychopathology, the personality traits, and the psycho- social problems of adolescents, aged between 12 and 19 years. APS-SF includes 12 clinical subscales and 2 validity subscales. Six clinical subscales focus on the DSM-IV symptomatology. They have been elaborated to reflect

the main symptoms presented in the DSM-IV, which are associated with the following disorders: conduct disorder (CND), oppositional defiant disorder (ODD), major depressive disorder (MDD), generalized anxiety disorder (GAD), posttraumatic stress disorder (PTSD) and substance abuse (SUB). The other six clinical subscales, though not specifically associated with the DSM-IV disorders or symptoms, screen relevant aspects related to various psycho-social problems of teenagers. These subscales include: eating disorder (EAT), suicide (SUI), academic problems (AP), anger/violence proneness (AVP), self-concept (SC) and interpersonal problems (IP). The two validity subscales focus on defensiveness (DEF) and the consistency response (CR) and examine the validity of the answers.

APS-SF was created and standardized for the screening of adolescents between 12 and 19 years of age. Teenagers can easily answer the test in approximately 15-20 minutes. All raw scores obtained at the APS-SF scales are then converted in standardized scores, by means of a linear transformation, in order to obtain T scores, situated at a mean of 50 and a standard deviation of 10. Except from the DEF and CR scales, the T scores of the APS-SF scales should be interpreted with the help of a 5-level system that links the deviation of the T score from the mean, within the normative sample, to the clinical severity level (Table 4.3.2.).

Table 4.3.2. *Descriptions of Clinical Severity Level of Psychopathology Associated With APS-SF Scores*

T score range	Clinical description/interpretation
Under 60	Normal
60-64	Sub-clinical symptoms
65-69	Mild clinical symptoms
70-79	Moderate clinical symptoms
At least 80	Severe clinical symptoms

4.3.2. Aim: The aim of our study was focused on adapting and validating the Romanian version of APS-SF.

4.3.3. Method

4.3.3.1. Participants

We used two samples of subjects, a clinical (N = 270) and a non-clinical (N = 1552) one. In the non-clinical sample, the participants had between 12-19 years, m=15.46 and SD= 1.95; 41.8% were boys and 58.2% were girls. In the clinical sample, the participants had between 12-19 years, m=15.21 and SD= 1.82; 45.6% were boys and 54.4% were girls. In the clinical sample, all teenagers had a clinical diagnosis determined by a specialist (a psychiatrist or a clinician).

4.3.3.2. Procedure

We conducted our study in three stages: the translation of the scales from English into Romanian and their retranslation into English; the pilot-study conducted in order to verify the translated items; the identification of the psychometric properties (reliability and validity) of the Romanian version of the test.

4.3.3.3. Instruments

In order to perform the validity and reliability studies, the following instruments were used:

- ***The Adolescent Psychopathology Scale, short form*** (APS-SF; Reynolds, 2000).
- ***YSR*** (Achenbach & Rescorla, 2001). The Achenbach System of Empirically Based Assessment (ASEBA).
- ***Spence Children's Anxiety Scale*** (Spence, 1998).

4.3.4. Data Analysis: The statistical data analysis was performed with the 16.0 version of the SPSS programme.

4.3.5. Results

4.3.5.1. Validity

a. The aim of this validity study was to investigate the extent to which APS- SF discriminates among the clinical and non-clinical population. For each person from the clinical sample we randomly chose a person, of the same gender and age, from the non-clinical normative sample. In this way, we formed pairs from the samples, made of a clinical and a non-clinical element. The differences between means ranged between .846-9.062. For all the clinical subscales, the calculated mean is higher in the clinical sample than in the non-clinical one. Except for the Conduct Disorder (CND) and the Consistency Response (CR) subscales, the score means are significantly different for the clinical and non-clinical population, at least at p=.001. Relying on these data, we can conclude that the Romanian version of APS-SF has a strong discriminative power between clinical and non-clinical population.

b. In order to examine the construct validity of the APS-SF, more precisely to identify the global structure of the test, we used a factor analysis, applying the oblique rotation method (also called the main factor method). We operated an oblique rotation with delta (Δ) set at .0.

In the case of the non-clinical sample, we identified two factors with a proper value (λ) of 6.317 and 1.666. These two factors explained 66.52% of the total variance. The subscales' saturations in the two factors are presented in Table 4.3.7. The first factor has greater saturations, between .444 and .899, for seven subscales that screen the symptomatology of the internalizing disorders: MDD, PTSD, IP, GAD, SC, SUI, EAT. The second factor shows high saturations, between .457 and .821, for the five subscales that generally screen the symptomatology of the externalizing disorders: CND, SUB, AVP, ODD, AP. The CND subscale has the highest

saturation in this factor (.821), being considered the prototype of the externalizing disorders, as it reflects a low capacity of behavioural control and a level of distress rather externalized. The AVP and AP subscales show high saturations in the 2nd factor, but they also reflect high saturations in the 1st factor, which indicates the fact that these problems present a symptomatology specific for both the externalizing and internalizing disorders.

In the case of the clinical sample, we identified two factors with a proper value (λ) of 6.115 and 1.925. These two factors explained 67% of the total variance. The first factor shows higher saturations, between .353 and .940, for seven subscales that screen the symptomatology of the internalizing disorders: MDD, PTSD, IP, GAD, SC, SUI, EAT. The second factor has high saturations, between .342 and .916, for five subscales that generally screen the symptomatology of the externalizing disorders: CND, SUB, AVP, ODD, AP.

The data from clinical and non-clinical samples are converging, therefore we can conclude that the factor analysis confirms the construct validity of the APS- SF scales on Romanian population.

c. In order to establish the construct validity, we tested the convergent validity, by correlating the APS-SF scores with those obtained at other instruments that also screen for similar constructs.

First, we calculated the linear correlation coefficients between the APS-SF subscales and the YSR scales. The sample comprised 61 adolescents, between 12 and 13 years old (M = 12.05; SD = .22), 28 boys and 33 girls, chosen from a non- clinical population. We obtained correlation coefficients, significant at p≤.05, for most subscales that screen similar constructs and non-significant correlation for dissimilar scales. In general, we obtained significant correlations with most YSR scales, even for the disorders that have different symptoms, such as the oppositional defiant disorder and the generalized anxiety, aspects that can be explained by the possible comorbidity of the symptoms within the disorders.

In the same time, we studied the convergent validity of the APS-SF subscales with the Spence Children's Anxiety Scale (Spence, 1994). The sample comprised 61 children, between 12 and 13 years old (M =12.05; SD = .22), 29 boys and 32 girls, chosen from a non-clinical population. The results of the correlation show significant values at p ≤. 05, between the Spence Children's Anxiety scale and the APS-SF subscales that screen internalizing disorders and non-significant correlation with externalising disorders, which support the convergent validity of these APS-SF subscales. The only one exception refers to conduct disorder, which has a significant value of the correlation at p ≤ .01 with the total score of the scale. This can be explained by the comorbidity of conduct disorder with some forms of anxiety, especially separation anxiety and obsessive-compulsive symptoms.

d. We calculated the linear correlation coefficients, between the APS-SF clinical

subscales scores obtained by a non-clinical sample (N = 1094) and a clinical one (N = 171). Overall, we obtained moderate to strong correlation coefficients between the subscales that screen disorders with similar symptoms, namely, among the internalizing ones and among the externalizing ones. For example, in the non- clinical sample, we obtained strong correlation coefficients between the MDD and PTSD subscales (r = .785) and between the MDD and GAD subscales (r = .769), and lower values for the correlations between non-similar disorders, such as the CND and MDD subscales (r = .260) and between the CND and SUI subscales (r = .246). The significant values of the correlations between dis-similar disorders, even if are represented by low values may indicate the fact that they arise in comorbidities. In the non-clinical sample, non-significant correlation values were obtained between EAT and CND (r=.054, ns.) and between EAT and SUB (r=.036, ns.) probably because of the dis-similarities of the simptoms presented. To conclude, considered together, the data on discriminative power, factor analysis, and convergent validity strongly support the validity of APS-SF for Romanian population.

4.3.5.2. The reliability of APS-SF

4.3.5.2.1. Test-retest coefficients

APS-SF was administered twice, over a two-week's time, to 65 persons (23 boys and 42 girls), of 12 to 19 years old (M = 15.02; SD = 2.12) from a non-clinical population sample. Excepting for the Consistency response subscale, for all the other subscales, the linear correlation coefficients are positive and significant at p < .001. For the Consistency response subscale, the linear correlation coefficient, is non- significant at p < .05, but the tendency toward stability is strong enough, despite the high heterogeneity of the scale. For all scales, the difference among the means of the test and retest scores is insignificant at p < .05. This proves that the test reflects stable results over the time.

4.3.5.2.2. Internal consistency results

We calculated the internal consistency using the α coefficient (Cronbach, 1951, as cited in Reynolds, 2000). We used the normative non-clinical sample for APS-SF (N = 1552). The α coefficients varied from .367 to .953. The lowest values were registered for the Substance abuse subscale (SUB), probably as a consequence of the fact that the items refer to different substances or substance categories (beer, spirits, other drugs or alcohol etc.). Also, we noticed low values for the response validity subscales, namely for the Defensiveness (DEF) and the Consistency response (CR) subscales, as expected, given the fact that these subscales are composed of items that are not very homogenous.

4.3.5.2.3. Item-scale and inter-item correlations

For each subscale, we calculated the correlation coefficients between each item of the subscale and the remaining ones, after the elimination of that particular item. The item with total

subscale correlation coefficients in our non-clinical sample varies from .101 to .712, and in clinical sample vary from .212 to .745. In the American sample, those coefficients vary from .130 to .620 in the non-clinical sample and from .120 and .760 in the clinical sample. The median item-with-total subscale correlation coefficients, obtained for the Romanian samples, are close to those obtained for the American sample. As in the American sample, we obtained low coefficients in the case of the response validity subscales, DEF and CR, as expected, given the nature of these subscales.

In what concerns the inter-item correlations, the values obtained for the Romanian non-clinical samples vary from .037 to .533 and in the clinical sample vary from .069 to .519. In the American non-clinical sample, the correlations vary from .060 to .520 and in the clinical sample, vary from .040 to .610. As expected, the lowest correlation coefficients were obtained both on Romanian and on American population, in the case of validity scales. To sum up, in the case of iter-item correlations the values obtained for the Romanian samples are similar to those obtained in the American sample.

4.3.6. Conclusions and discussions

All the statistical analyses performed in order to identify the psychometric properties of the instrument support its practical and research utility. The results obtained for the Romanian sample are similar to those obtained for the American sample. APS-SF can be used during the screening, intervention, evaluation and the research processes.

Our aim was to validate the APS-SF scale on the Romanian population. APS-SF proved to be a valid and reliable instrument, useful for the screening of clinical disorders in teenagers. The practical research implications are quite relevant for mental health specialists (clinicians, psychiatrists) and for school psychologists. It is absolutely necessary to perform a screening of the child and adolescent clinical disorders, in order to identify and treat the mental health issues and, therefore, to prevent them.

4.3.7. Limits and new research directions

There are a few limits to the results of this study. Firstly, not all the disorders evaluated by the APS-SF were found in the clinical sample. Secondly, some of the participants in the clinical group were diagnosed by different psychiatrists and clinical psychologists from all over the country, who studied in different schools and use different reference systems when clinically diagnosing patients. It is possible that some of the participants also had other unspecified psychological disorders. This is why we intend to run a series of further studies.

Chapter 5. Conclusions

Following the research and development actions described in this paper, PEDonline -an online assessment platform for children and adolescents has been created. Its development is based on the psychological assessment principles stipulated in the literature: multi-method and multi-informant evaluation, multistage assessment, current and longitudinal assessment, integrated solutions, user-friendly, constant up-grade responsive system etc. The platform has the following functions for each user:

1. Assessment of neuropsychological development;
2. Assessment of school readiness;
3. Assessment of mental health;
4. Evaluation for carrier counseling;
5. Evaluation of learning strategies and school motivation;
6. Self- awareness and personal development;
7. Personalized evaluation.

The 01 (Alpha) version of PEDonline was built between 2012 and 2013; it has been tested in an ecological environment on 152 patients between 2013 and 2016. Based in the feedback from patients and psychologists who have used it, version 02 (Beta) has been built in 2016. The latter has been submitted to functional testing based on preset scenarios (*black-box testing*) and to an ecological testing on 107 participants.

The usability study aimed at assessing the extent to which the needs of parent/tutor and psychologist users are met when performing a psychological assessment with PEDonline. Results suggested a high general usability level indicated by 90.25% of parent-users, that is 37 out of 41 parents included in the study. Only 4 parents (9.75%) indicated a moderate usability. Regarding the psychologist users (N = 44), results showed as well a high usability -indicated by 90.90% of the psychologists included in the study. Only 9.10% indicated a moderate usability.

The platform has been subjected to validation in three ways: a) compared to similar platforms, b) compared to the guidelines for Computer-Based and Internet Delivered Testing (ITC, 2006) and c) compared to itself -SWOT analysis.

The conclusions of the comparative analysis of PEDonline with other similar systems available internationally showed that PEDonline integrates several benefits: it involves multistage assessment, where every step of the evaluation process contributes to the next one; integrates multiple assessment methods - psychometric and non-psychometric ones, bringing more clarity to the assessed dimensions; the assessment tasks are particularly designed for children (see NEPSY), not adapted versions of instruments for adults; the platform allows multiple longitudinal assessments which can be useful for marking the development of a competency, for assessing the effects of an intervention and their stability (at follow-up, for example); the evaluation goals included in the platform reflect the most frequent assessment needs of children and teenagers; the platform includes a large number of instruments which can be used in a variety of combinations as indicated by the psychologist; it integrates audio-video communication methods.

When compared to the Guidelines for computer-based and internet delivered testing formulated by the **International Test Commission** (2006), PEDonline is shown to include in its design and functions most of these recommendations (78.6 %).

The SWOT analysis of the platform indicated that PEDonline has more strengths than

weaknesses and it shows an increased value to the current psychological evaluation practice. Threats can be controlled as long as they are understood by the professionals who use it. Opportunities and future research directions emphasized by this analysis are major and have an immediate impact on practice.

Every stage of the development was assigned a technological development level. Thus the beginning of the research and development endeavor corresponds to an early technological development stage, that is level 2 - TRL 2. The usability analysis of PEDonline, the comparative analysis to similar platforms, the demonstration of ITC guidelines for computer-based and internet delivered evaluation integration in the platform and the SWOT analysis prove the reach of level 8 of technological development (TRL 8). Consequently, the product demonstrates its usability/utility of its final version in the operational context it was designed for. These are arguments support the idea that PEDonline is a product in its Beta version which can be considered valid.

For reaching the second aim, three studies have been conducted: the adaptation of the Early Child Inventory (ECI-4) on Romanian population -preliminary results; the adaptation of the school aged Child Symptom Inventory (CSI-4); the adaptation of the Adolescent Psychopathology Scale (APS-SF) on Romanian population.

The main objectives of the Adaptation of the Early Child Inventory (ECI-4) on Romanian population study were to adapt, validate and create norms for the Romanian version of ECI-4 (*Early Childhood Inventory-4* – ECI-4; Gadow and Sprafkin, 2000). The analyses performed in order to identify the psychometric properties of ECI-4 recommend using this instrument for practical and research purposes. The scale was proven as a reliable and valid instrument for the assessment of psychiatric disorders in Romanian children. Versions for parents and educators also demonstrated good psychometric properties.

The objective of the study Adaptation of the Child Symptom Inventory – 4 (CSI-4; Gadow and Sprafkin, 2002) on Romanian population was to identify the psychometric characteristics of the Romanian version of the instrument designed to assess children between 7 and 12 years old. The analyses performed showed good psychometric indicators, supporting the use of the instrument. Consequently, the instrument can be used in evaluation processes, in research contexts, in assessing short and long term effects of psychological interventions. Because few clinicians can afford to interview the teachers of the children, the version for educators is an extremely useful instrument for identifying behaviors and symptoms in the school environment.

The objective of the study the Adaptation of the Adolescent Psychopathology Scale (APS-Short Form, Reynolds, 2000) on Romanian population was to adapt and validate the Romanian version of the instrument. Statistical analyses showed good psychometric properties, which support the use of the instrument in clinical and research contexts. Results obtained in the Romanian sample are similar to those found in the American sample by the authors of the scale. APS-SF can be used in the assessment process, intervention evaluation and for research purposes.

The present paper has several limitations. For example, the usability study provided data only for the parent and psychologist user. The adaptation of the screening instruments on Romanian population studies contain some limitations and future research directions. More specifically, in the case of ECI-4 and CSI-4, the clinical samples have been relatively small and did not cover all clinical disorders assessed. Consequently, not all sensitivity and specificity values could have been computed.

The development of a computer-based assessment platform for children and adolescents has implications per se. We hope that by using this platform on a large scale, we can overcome different barriers that can intefere with accessing and receiving psychological services. The implications of the studies which described the adaptation processes on Romanian populations for the different instruments reach parents, mental health professionals, as well as teachers and are linked to improving the quality of psychological services addressed to children, teenagers and their families.

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