



Department of Health care and Social Work

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**Validation and digitisation of the PTESS game-
based learning skills assessment scale
aged 0 to 4 years**

ABSTRACT

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Contents

| | |
|--|----|
| Introduction | 5 |
| Chapter 1: Theoretical framework of the problem of child development assessment and parental involvement in the process of learning skills formation | 6 |
| I. Play as the main means of assessing child development at the age up to 4 years | 6 |
| II. Theoretical framework of the training | 9 |
| IV. Theoretical framework of the digitalization process..... | 12 |
| Chapter Two: The PTES Game-Based Learning Programme and PTESS Game-Based Learning Skills Assessment Scales | 13 |
| I. PTES Learning through Play Programme | 13 |
| II. Scales for the assessment of learning skills through play PTESS | 14 |
| III. Validation data from the implementation of the PTES Game-Based Learning Programme and the PTESS Game-Based Learning Skills Assessment Scales | 19 |
| Chapter Three: Methodology, Stages, Conduct and Results of the Study | 23 |
| I. Stages and procedure of the study | 25 |
| II. Methods and Instrumentation of the PTESS Scale Verification Study | 26 |
| III. Methods and tools for conducting PTESS scale digitization | 32 |
| IV. Methods and tools for conducting research through monitoring and social psychological training to support the use of the PTESS digitization scales for parents and professionals | 36 |
| Conclusion, generalizations and implications in the overall theoretical-empirical study in the dissertation | 48 |
| Conclusions | 49 |
| References | 51 |
| Conclusion | 53 |
| Contributions of the PhD student | 54 |

The dissertation contains 288 pages (168 pages main body and 120 pages appendices), 30 tables, 5 figures, 6 graphs, 3 diagrams and 26 screen shots. The bibliographic list to it unites 251 literature and documentary sources, of which 202 in foreign language and 49 in Bulgarian.

The following are directly related to the development of the thesis:

1) Author publications

- (a) scientific publications - 5, of which 3 in English, indexed in SCOPUS
- (b) citations - 2, of which 2 in English, indexed in SCOPUS

2) Academic didactic results

The author is a titular lecturer as a guest lecturer at the NBU of the following academic courses - in Bulgarian and English, developed in electronic form and published in MOODLE. The courses are taught in interactive mode, with a variety of multimedia presentations and other digital applications products.

1. LOGB707 Diagnosis and therapy of craniofacial anomalies, rhinolalia, 30hrs. - Autumn 22/23; Autumn 23/24 at the Speech and Language Therapy
2. LOGB504 Swallowing Disorders, 30 hrs /Fall 22/23; Fall 23/24/ to Speech Therapy BP
3. LOGM207 Rhinolalia Therapy, 30 hrs /Spring 22/23; Fall 23/24/ at the Speech and Language Pathology MP
4. REHM 155 Therapy for Rhinolalia /Spring 22/23; Fall 23/24/ - 30 hrs. in MP Speech-Language Pathology in English.
5. REHM156 Case study /Spring 20/21/ in MP "Speech and Language Pathology in English"
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3) Publications on the dissertation topic

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2. Mihova P., **N. Iordanova**, Sv. Kartunova, N. Borisova, Best practices and achieved results from fieldwork with disabled and disadvantaged children, Eastern Academic Journal, ISSN: 2367-7384, Issue 2, August, 2023, pp.21-29
3. **Iordanova, N.**, Tsoukka, K., Mavrothanasi, M. (2023). Development of Three Language Digital Platform for Early Childhood Development Screening PTES - Preliminary Parents Self-check Results. In: Chen, Y.W., Tanaka, S., Howlett, R.J., Jain, L.C. (eds) Innovation in Medicine and Healthcare. KES InMed 2023. Smart Innovation, Systems and Technologies, vol 357. Springer, Singapore. https://doi.org/10.1007/978-981-99-3311-2_2 (SCOPUS)
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Introduction

This dissertation is devoted to the verification and digitization of an original scale for the assessment of learning skills through play PTESS (Pumpkin Therapy and Education System Scales), designed for children aged 0 to 4 years. The main aim of the study is to validate the reliability of the author's tool as a means of monitoring child development, adapted for professionals and parents. The PTESS scale is a specialized instrument developed to assess learning skills in children aged 0 to 4 years, using play as the primary method for monitoring and developing cognitive, social and motor skills. It has been developed to assist in the early detection of possible developmental difficulties, and to provide structured support for parents and professionals in monitoring and planning therapeutic and educational programmes. The main aim of the PTESS scale is to offer a reliable assessment and diagnostic tool that can be used by professionals and parents alike. The validation of the PTESS is the main aim of the present study, seeking comparability with the results of the Munich Functional Diagnostic of Development (MFED). The dissertation also explores how digitization of the PTESS may facilitate its use and increase its accessibility for parents, which in turn could lead to more timely identification of therapy and support needs in child development.

At the core of the PTESS scale concept is the idea that play is a primary method of assessing and promoting child development. Play allows professionals and parents to observe the child in a natural environment while stimulating a variety of skills. The implementation of the digital self-assessment platform based on the PTESS scale represents an important innovation that encourages parents to actively participate in the child's assessment and sets the stage for faster identification of areas requiring therapeutic intervention.

This dissertation examines significant theoretical concepts about the role of play in early childhood development, as well as the benefits of digitalization as an approach to contemporary assessment and therapy. The data collected and analyses provide the opportunity to develop practical training programs for families to support the successful socialization and integration of the child into society.

Not only does the work look at play as an essential developmental tool, but it also explores how early parental involvement in this process affects children's ability to learn, communicate and socialise. Parents play an important role in the early years when children are learning basic skills and forming their first social relationships. Through the use of the PTESS scale and the implemented digital platform, parents can receive detailed and systematic feedback on their children's development, which creates a basis for more effective and targeted parenting support. In this sense, the digitalization of PTESS facilitates access to assessment tools and supports not only professional diagnosis, but also family engagement in the process of child learning and development.

The study also aims to demonstrate the benefits of a digital self-assessment platform that supports the assessment of learning skills, making it more accessible, more convenient and more reliable for parents. The platform collects and analyses data, converting it into recommendations and guidelines that can be used in future therapeutic and training programmes. In addition, the digital version allows monitoring of children's changes and progress at different stages of early childhood, providing the opportunity to adapt the approach in real time and to make timely adjustments in the presence of delays or other developmental problems.

The empirical part of the study includes a detailed analysis of the results collected from children aged 0 to 4 years, and the data are compared with the results of the Munich Functional Diagnostic. Correlational and factor analyses were performed to assess the reliability and validity of the PTESS, making the instrument valuable for both clinical and research practice.

The present work aims to validate the PTESS methodology and integrate it into the digital sphere, which enables an increase in the effectiveness of work with families and professionals. In conclusion, this thesis seeks to show how digitalization can play a crucial role in increasing the quality and accessibility of early diagnosis and intervention, by uniting the efforts of professionals and parents in the care of children's development.

Chapter 1: Theoretical framework of the problem of child development assessment and parental involvement in the process of learning skills formation

I. Play as the main means of assessing child development at the age up to 4 years

1. Description of the understanding of play

Play is a process of communicating, acquiring and exchanging communicative and social experiences, learning and sharing information, developing a variety of skills and applying them to new situations. Play is a leading activity for a child's developmental stage and is associated with dynamism and pleasurable sensations, as well as with the participation of at least two people (Hoysinha, 2000; Stamatov, 2000).

During the early childhood years, each child passes through the stages of sensory, psychomotor, language, and cognitive development to reach school age to acquire academic skills (Ayres, 2005; Hellbrügge, 2010; Leach, 1984). Logically, as individual senses and mental processes develop and through their integration, play changes and evolves. A good knowledge and understanding of the process of play in different developmental periods opens many doors for adults to communicate with the child. Careful observation of play enables professionals to assess and stimulate current skills and developmental problem areas without stressing the child into a testing situation (Bell, 2024; Geringer, 2011). A child's play provides us with information about the different sensory systems (visual, auditory, tactile, vestibular, and proprioceptive) and how they function in synchrony (Ayres, 2016; Kranowitz & Miller, 2022; Kranowitz, 2003).

Play is an activity that provides an opportunity to stimulate all areas of a child's development and at the same time can be a therapeutic tool for a variety of disorders following a precise assessment. Play is the activity that connects the world of adults with that of children, so it should be a primary means of stimulation and communication (Stamatov, 2000; Stoitsova, 1992; Slivenski, 1994).

2. Rules for playing with young children

Communication with children up to 18 months is built on the child's movement abilities and the degree of development of his sensory integration (Ayres, 1973). The communicative field of children up to 18 months is as extensive as their ability to move and navigate (Stoitsova, 1992). In relation to this, in order to structure play with the child, it must be adequate to his or her capabilities - vision and visual tracking, gross motor and positioning, fine motor and visual-motor coordination.

The child's key skills guiding parent-child play choices and opportunities, in the age range up to the end of 48th months, are tabulated in Appendix 1 of this dissertation.

3. Types of games in early childhood

According to the understanding of our modern society, there are three types of activities that determine a person's belonging to a certain age group - playing, learning, working (Aufenanger, 2019; Hoesinha, 2000). What intrigues us in the development of Pumpelina's PTESS therapeutic and learning system is how valid this statement is. According to him, play is what young children are capable of and it is the main activity of their daily life, whereas for grown-ups play is not of primary importance.

Penelope Leach (Leach, 1986) describes the forms of play in order of occurrence: play of the child with self, play of the child with the parent, play to stimulate partnership, play to stimulate imitation, play with objects, play with imaginary objects, play to stimulate communication, play for language development, role play, play with moving puppets. In her theory of child development, she points to the equivalence of two factors - partnering with parents in play time after 9th months of the child's age and partnering with another child in play time after 18th months of the child's age. Children's ability to transfer partnering experiences to different play situations can be taken as a predictor of learning through play skill formation.

4. Development of learning skills through play

It is customary to consider human development from the moment of birth, although many different theories of prenatal experience exist (e.g., Stanislav Grof, 1985). The contemporary diagnostic community is also familiar with different models of life course interpretation - Psychosocial Development (Erikson, 1992), Psychosexual Development (Freud, 1991), Moral Development (Kohlberg, 1958), Intellectual Development (Piaget, 2001), Functional Psychomotor Development (Bayley, 2005). In this regard, human development is also examined and assessed from younger to older ages, with the various diagnostic scales focusing on skills of priority importance for the age period (Leach, 1986).

The Munich Functional Diagnostic Scale for Development (MFED) (Hellbruegge et. al, 1994) is a methodology created by Theodor Hellbruegge, Fritz Lajoschi, Dora Menara, Reglindis Schamberger, and Thomas Rautenstrauch (Hellbruegge et. al, 1994). It is based on indicators whose equivalents can be found in the Bayley Scales of Infant Development (Bayley, 2005) and the Denver II test standardized for Bulgaria. The difference with these methodologies is the addition of a percentage tolerance between 50% and 95% after 8th months of child development due to the inclusion of social-pediatric components related to play and mother-child interaction.

The developmental domains are considered in two broad age categories, up to 12 months and up to 46-54 months, because the assessment assumes 100% criteria attainment in the age up to 12 months, and 50% to 95% criteria attainment in the age 8 to 46-56 months. In the age up to 12 months, the methodology is entirely based on the positional responses according to Vaclav Vojta (Vojta & Peters, 2018) and the development of neurological reflexes with their onset, decay and build-up.

An extremely important condition for the development of learning skills through play is the establishment of successful two-way communication between parents and child.

Communication is the process of exchanging messages between at least two individuals. It can be verbal or non-verbal, direct or indirect, effective or ineffective, positive or negative. In order for an individual to learn to communicate, the parents must have contributed to the development of the triad "Partnership - imitation - speech" and the child must be motivated to exchange messages. Unfortunately, when communication is difficult, there is a neurological, psychological, sensory or anatomical reason for this.

Tolya Stoitsova (Stoitsova, 1992) differentiates three types of communication in terms of direction - downward (between parents or teachers and children), horizontal (between individuals at the same level) and upward (towards elders or superiors). The classical scheme of communication according to the information model includes three elements (Mihova P. et al., 2022; Mizova, 2014; Raynov, 1993): communicator, message, recipient. Of utmost importance are the number of participants in the communication process, as well as their gender. The fact that the participants are constantly switching roles in the course of communication should not be overlooked. In order for a communication to be successful, the message code needs to be shared between all participants, with the information consciously conveyed reaching us through speech and unconsciously through body language.

Another important factor relevant to the formation of learning skills through play is related to the development of communication between parents and children is the formation of attachment between them. Attachment is a physiological, cognitive, emotional and social phenomenon (Matanova, 2008). It is formed in the process of interaction and starts from the parent through nonverbal signals and becomes a system of mutual regulations. Important to the development of attachment are touch, eye contact, smiling and the way the baby cuddles into the mother or father.

Having said all of the above, one peculiarity in the acceptance of parent-child communication in our country should be noted, stemming from the understanding that interaction is primarily verbal in the direction of the adult to the newborn, for the purpose of speech development. This understanding is based on outdated theories in the study of child development in terms of perceptual, social and speech levels. A very large number of specialists use the existing Manova-Tomova ladder diagnosis of early development (Manova-Tomova, 1955) as the basis for conclusions about the level of communicative abilities, which unfortunately does not correspond to modern psychological and speech therapy research. This leads to the stereotypical understanding that the lack or improper development of the ability to communicate below the 3rd year of a child's life does not constitute a significant difficulty in terms of future mental or linguistic functioning.

5. Development of communication skills

Non-verbal communication is the communication of information, emotions or ideas without the use of spoken or written words. Instead it relies on gestures, facial expressions, body language, eye contact, posture, tone of voice and other physical cues to convey a message. Nonverbal communication often complements or reinforces verbal communication, but it can also convey meaning on its own, sometimes even more powerfully than words (T. Stoitsoeva, 1992).

Play as a social aspect of communication is of great importance for children's development as an opportunity for sensory integration, for stimulating speech and psychomotor skills, for learning different communicative strategies. G. Piaget (Piaget, 2001) and the founders of the Munich Functional Diagnostic based their research on the play opportunities of the infant.

All play should follow a specific purpose to visually demonstrate the meaning of communication.

Penelope Leach (Leach, 1991) defines the following forms of play in the order of their occurrence:

- **The child's play with himself** (placement of body parts in space);
- **Child's play with the parent**
 - **Games to stimulate visual-motor coordination.**
 - **Games to stimulate partnership**
- **Games to stimulate imitation**

These games begin after the child has mastered the rules of partnering. The same sequence is used, but in this case the adult demonstrates new skills - movements, gestures and words, motivating the child to imitate him. It is very important that the parent gives simple commands to imitate and waits for a motor, non-verbal or verbal response from the child according to age ability.

- **Games to stimulate communication**
- **Games to stimulate language development**
- **Child's play with objects**

6. Formation of communicative parenting behaviour

Parenting behaviour is the sum of the actions, attitudes and practices that parents exhibit in their interactions with their children. These behaviours influence a child's emotional, social and cognitive development and shape their overall well-being. Parents' choices about how they discipline, communicate with, support, and educate their children play an important role in shaping a child's values, self-esteem, and interpersonal skills.

Different authors (Assenova, 2018; Minchev, 2000; Minchev, 2004; Stamatov, 2000) propose certain types of structuring strategies for the formation of communicative parenting behavior. What unites all theories is the fact that they are conditioned by the interaction between parents and child.

II. Theoretical framework of the training

1. Nature of monitoring for parents

Monitoring in translation means a process that is monitored over a period of time in order to keep a close track of a certain thing happening in it (Dictionary).

Parental monitoring refers to the strategies and actions parents use to monitor their children's activities, behaviour and well-being. This often includes tracking where children are, who they are with, what they are doing and monitoring their interactions with digital devices. Effective parental monitoring helps protect children, promotes positive behaviors, and reduces the likelihood of risky behaviors, especially as children enter adolescence (Ramos, 2010).

2. Structure of the training:

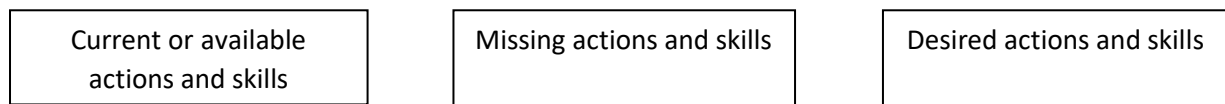
Lewin's (2012) ideas have strongly influenced contemporary approaches to learning and development, particularly in areas that prioritise experiential learning, team building and organisational change. His emphasis on understanding both individual and ecological factors and on strengthening learning to ensure lasting change continues to be a cornerstone of effective training programs.

The main actions of the trainer in training preparation are planning and needs assessment. K. Lewin (2012) proposes the following scheme:



The modern structure of training includes several more components -identification of needs, structuring of training, evaluation of results.

The needs assessment is carried out according to the following formula (Stattin & Kerr, 2000):



3. The essence of parent training:

Social-psychological training for parents involves helping them understand and improve social interactions and psychological approaches with children, often focusing on improving parenting skills, emotional intelligence, and communication abilities. These training programs use concepts from social psychology to teach parents how to support their children's development more effectively, create a positive family environment, and cope with parenting challenges (Brewmeister, 2007).

Social-psychological training for parents often takes place in group workshops, classes or consultations where parents can practice skills through role-plays, discussions and real-life scenarios. The goal is to provide parents with a range of social and psychological strategies to strengthen family relationships, promote healthy development, and create a supportive, nurturing home environment (Brewmeister, 2007).

Social-psychological training for parents (families or cohabiting couples) is a form of social learning through personal experience with the aim of introducing new or correcting existing parenting behaviour. Training may have the following goals (Khanom, 2020; Raynov, 1993):

1. Prevention;
2. Correction;
3. Training parents as co-therapists;
4. Setting up a self-help or supervision group for parents with roughly the same family difficulties.

3.1. Types of training for parents

Based on a theoretical review on the development of groups (Lender et al., 2023; AVIS, 2007), families as groups, monitoring in speech therapy (Benedon, 2018) and the application of social psychological training, I propose an authorial classification of types of training for parents, justified according to the purpose of the training.

3.1.1. Prevention training

3.1.2 Corrective training

3.1.3. Training of parents as co-therapists

3.1.4. Training for the purpose of creating a self-experience group or group supervision

4. Forms and systems of training for parents

Parent training can take many forms, each designed to meet specific needs, learning styles and contexts. These programs can be delivered through one-on-one sessions, group workshops, online courses, or even community events.

Parent training systems are structured programs designed to teach parents strategies to improve parenting skills, promote healthy child development, and address behavioral or developmental challenges. Each system includes specific methods, techniques, and frameworks tailored to different needs and contexts (Brewmeister, 2007; Waldman, 2021).

These systems incorporate evidence-based techniques to address a wide range of parenting needs, from behavior management and emotional connection to skill building and support for specific developmental challenges. Choosing the right system often depends on factors such as the age of the child, specific parenting goals, and the needs of the family.

For the purpose of the dissertation the following author's classification of the forms of social-psychological training was developed:

4. 1. Forms of social-psychological training for parents

- One-day (duration 8 hours);
- Two-day (duration 16 hours);
- Modular (duration 40 hours).

III. Theoretical framework of the verification process

Validation and verification processes are key to ensuring the quality and reliability of data and tools, particularly in the area of developing evaluation and training methodologies. The theoretical basis for these processes includes concepts and approaches described by numerous authors and researchers, including John Rushby (Rushby, 1993), who discusses validation and verification as important aspects of ensuring reliability in engineering and software systems, and Craig Silverman (Silverman, 2022), who provides guidelines for data verification in the context of digital and journalistic applications.

1. Validation

Data validation is the process of ensuring that the data used meet certain standards or criteria. This validation process involves checking the data for accuracy, consistency and completeness, and ensuring that it meets certain formatting requirements. The purpose of data validation is to ensure that the data used are reliable and can provide accurate insights or evidence.

2. Verification

Verification is the checking of data.

Data verification is the process of reassessing the accuracy and completeness of data. This process involves comparing data with a reliable source to ensure that it is correct and has

not been altered. The purpose of verification is to identify and correct any errors or inconsistencies that may exist in the data.

Verification of a development scale could include:

1. Validity of content
2. Reliability testing
3. Structural stability
4. Stability of the criterion
5. Normalization and standardization
6. Analysis of the elements

3. Comparative characteristics of validation and verification

Verification and validation processes are often used together to increase the security and reliability of results. According to Philip Crosby (Crosby, 1979), early implementation of verification and validity processes can reduce the long-term costs and effort associated with correcting errors and inaccuracies.

Validation is used to check that the data falls within the allowed range of values. It is applied during the creation of data, scales, instruments.

Verification checks the accuracy and precision of the data and is used when the data, scales and instruments created undergo change or have been used for over 10 years (Silverman, 2022).

In conclusion, validation and verification are interconnected processes that ensure that tools such as PTESS and the PTES Learning Through Play programme are effective, reliable and applicable in practice. These steps not only ensure high-quality data and outcomes, but also create a foundation for sustainable development and innovation in the field of child learning and assessment.

This dissertation presents the creation and validation of the PTES game-based learning program, as well as the creation and validation of the PTESS game-based learning skills assessment scales. The validated program and scales are the subject of a verification study due to use over 10 years.

IV. Theoretical framework of the digitalization process

The theoretical framework of the digitalisation process encompasses the overall concept of transforming and managing data and processes using digital technologies. In order to fully understand this topic, it is important to consider the historical aspects of the development of digitalization as well as the theoretical foundations and differences between digitization and digitalization.

Digitization is the process of converting analog information into digital format. In this format, information is organized into discrete units of data called bits, which can be addressed separately, usually in multi-bit groups called bytes (Yasar, 2022).

Digitisation and **digitalisation** are interrelated concepts, but they are far from meaning the same thing.

Digitization is the process of converting analog information into digital format. It is the initial step towards the creation of digital data that allows information to be processed, stored and transmitted through computer systems. In the 1970s, digitization expanded with the advent of better scanning devices and software solutions to convert documents and images into digital format. The advent of personal computers in the 1980s and later the use of CD and DVD media further aided the digitization of large volumes of data (Ceruzzi, 2003). The main purpose of digitization is to make information accessible for computer processing.

Digitalisation in modern society is evolving through two main strategies:

1. **Data digitization:** converting analog information into digital format for easier storage and access.
2. **Digitization of processes and systems:** applying digital technologies to optimize and automate processes, resulting in better resource management and improved customer experience (Westerman, Bonnet & McAfee, 2014).

Application of digitalization in dissertation work

This dissertation uses both digitization and digitalization. Converting various information sources and child development assessment tools into digital format is a fundamental part of the work. Digitization of processes is achieved through a purpose-built platform that provides access to the PTESS scales and allows for easy interaction and data collection.

Digitization of the PTESS scale aims to increase the accessibility and efficiency of the assessment process, while offering opportunities for better monitoring and adaptation of treatment strategies. This platform provides the ability to monitor results in real time and offers automated recommendations for interventions.

Digitisation and digitalisation are key processes in modern society that are developing on the foundations of historically significant discoveries and technological innovations. By integrating these concepts into educational and social projects, such as this dissertation, new opportunities are created for effective and modern assessment and support of child development.

Chapter Two: The PTES Game-Based Learning Programme and the PTESS Game-Based Learning Skills Assessment Scales

I. PTES Learning through Play Programme

The Munich Functional Diagnostic Scale for Development (MFED), (Hellbruegge et al., 1994) and Penelope Leach's (Leach, 1986) game theoretic rationale were chosen to construct the PTES program and scales to assess PTESS learning skills.

All the scales are designed in accordance with the requirements for the development of learning skills through play at different age periods and the academic skills required for this. They are structured based on the theories of the founders of the MFED (Hellbruegge et al., 1994), as well as the theories of J. Piaget (Piaget & Inhelder, 1972) and P. Leach (Leach, 1984).

The development of the PTES Learning Through Play Program and PTESS Learning Through Play Skills Assessment Scales emphasizes the following age-specific objectives:

1. **Age 1:** The goal is to build the foundation of the triad of partnership - imitation - speech. The focus is on motor skills, visual-motor coordination and basic social and communication rules.
2. **Age 2:** The goal is to stimulate imitation and language functioning as well as the development of independent and partner play. The emphasis is on enriching communication and cognitive skills.
3. **Age 3:** The goal is to form verbal and non-verbal communication, develop memory and concentration, and improve fine motor skills. Social games with rules are introduced first.

4. **Age 4:** The aim is to explore human relationships, develop speech and gain knowledge about the world around them. The emphasis is on enriching the cognitive sphere and passive vocabulary.
5. **Age 5:** The goal is to deepen cognitive skills and prepare for academic learning. The focus is on developing abstract thinking, emotional intelligence and social skills.

II. Scales for the assessment of learning skills through play PTESS

The design of the methodology includes a total of 4 scales, 33 categories, 158 items. The methodology applies to children aged 3 to 48/54 months. All categories are related to tracking the developmental level of social play behavior, in different forms for a certain age.

The PTESS learning through play assessment scales are attached in appendix 6 of the thesis.

It is necessary to pay attention to the fact that at a certain age a greater number of indicators prevail in one or another category of play. Due to the rapid development of the child's motor abilities at the age of 0 to 12 months, the prevalence of the athymemes in the categories of the child's play with objects and play during feeding. The age between 12 and 24 months is characterized by a very effective development of the child's communicative abilities. The imminent separation of the self is a prerequisite for the accumulation of skills in all categories of play and is a prerequisite for the emergence of independent play as a distinct subcategory within the category of the child's play with objects. The communication play category represents an extension of the possibility of understanding and transferring communicative behaviour and is a prerequisite for the emergence of the following subcategories language development play and role play. In the age range from 24 to 36 months, we observe a relatively equal ratio between the categories of child play with objects and communication play. The impending age crisis of the Third Year is a prerequisite for the decline in importance of the category Role Play. Age 4 years we observe as the extreme predominance of the category Play for communication. This fact is directly related to the completion of the first stage of development of the child's higher cortical functions and the extreme influence of the educational environment in this period of child development (Mavlov, 2000; Raichev, 2001).

1. Description of PTESS scales by ages

1.1. PTESS scale - age 1

The PTESS scale can be used to examine children from 3 months to 12 months. It includes 7 criteria and 34 athymemes.

Criteria

Scale age 1 considers the following categories of games:

- **the child's play with himself** - this category is mainly associated with the formation of the child's body schema. As a result of developing motor skills and forming an awareness of the three-dimensionality of space, the child learns how to position his or her body in space to reach a goal or perform a goal-directed action (Kranowitz & Miller, 2022)

- **Child-parent play** - this category tracks the child's ability to signal cooperative activity to the parent (Chatoor, 2009)
- **Partnering play** - this category explores the opportunities for the child and parent to provide each other with incentives for joint activity (Leach, 2010)
- **imitation play** - the category tracks the development and formation of a child's skills in replicating a behavioural, motor or play pattern (Papousek, 2007; Lacan, 2006)
- **Child's play with objects** - This category tracks the formation of skills related to the child's development of hand movement and postulated responses. Assesses activities related to fine motor skills (Hellbrügge, 2010)
- **communication play** - this category is mainly related to the formation of communicative dialogic behavior between mother and child (Papousek, 2007)
- **Play at mealtimes** - Play at mealtimes is a social component directly related to speech development. The category tracks activities and skills with references to all other categories at age 1 (Chatoor, 2009; Winstock, 1999)

1.1.2. Items

The PTESS age 1 scale contains 34 items divided into the following categories:

- **Playing the child with himself - 3 athemes**
- **Child's game with the parent - 3 athemes**
- **Partnering Game - 4 Aims**
- **The Imitation Game - 3 Aytms**
- **Child's play with objects - 6 athemes**
- **Communication Game - 9 Aytms**
- **Playing at mealtimes - 6 aithems**

1.2. PTESS scale - age 2

The PTESS age 2 scale can be administered to examine children from 13 months to 24 months. Includes 9, one criterion child's play with self is dropped, due to reaching the age for its performance. The new criteria added are derived from the previous seven from age 1 year. The scale examines 47 athymemes.

1.2.1. Criteria

Scale age 2 considers the following categories of games:

- **Child's play with the parent**
- **Game of partnering**
- **The imitation game**
- **Child's play with objects**
 - **Subcategory Independent play** - this type of play can be observed as early as 6 months of age, but with very little duration due to the child's not yet refined motor abilities (Lozovyi, 2024). Only at the end of 12 months, the child's independent play results from copying the parent's behaviour and movements and lasts between 5 and 10 minutes (when partnered). The fact that the child is able to carry out two consecutive instructions and, at the end of month 24, three consecutive instructions is also significant.

- **Communication Game**
 - **Subcategory Language Development Game** - is related to the child's ability to nominate objects and subjects, compose a phrase and then a simple sentence. The emergence of this subcategory of play is related to the child's ability to understand movement and make analogies between action and reaction (Kaduson & Schaefer, 2006)
 - **Role-play subcategory** (Hoesinha, 2000) - arises as a result of building on the child's understanding of social and group (family) membership. Role play is extremely important in a child's life because it provides the child with the opportunity to form and understand higher social elements such as culture, art and religion.
- **Play at mealtimes**

1.2.2. Items

The PTESS age 2 scale contains 47 items divided into the following categories:

- **Playing the child with himself** - 0 aithems
- **Child's game with the parent** - 3 athemes
- **Partnering Game** - 4 Aims
- **The Imitation Game** - 3 Aytms
- **Child's play with objects** - 9 athemes
- **Solo Game** - 3 Aims
- **Communication Game** - 6 Aytms
- **Language Development Game** - 6 Aytms
- **Role Playing Games** - 6 Aytms
- **Playing at mealtimes** - 6 aithems

1.3. PTESS scale - age 3

PTESS age 3 scale can be applied to examine children from 25 months to 36 months. Includes 9, one criterion child's play with self is dropped due to reaching the age for its performance. The new criteria added are derived from the previous seven from age 2 years. The scale examines 39 athymemes.

1.3.1. Criteria

The PTESS age 3 scale addresses the following categories of games:

- **Child's play with the parent**
- **Game of partnering**
- **Child's play with objects**
 - Subcategory Solo play
- **Communication Game**
 - **A subcategory of the child's play with imaginary objects** - the development of imagination is an important factor in building a future learning strategy. Since not all objects or subjects can be materialized, visualized, felt or touched, it is necessary for the person to construct his own imaginary picture of them according to an existing description. In order to achieve this skill it is necessary

that the child initially forms the skill of incorporating into play familiar but currently missing objects, then subjects. And then to be able to embody all these skills in role play, in narrative, in retelling and in their own creativity (Levy, 2006).

- **Subcategory Language Development Game**
- **Subcategory Role-playing game**
- **Play at mealtimes**

1.3.2. Items

The PTESS age 3 scale contains 3 athemes divided into the following categories:

- **Playing the child with himself** - 0 aithemes
- **Child's game with the parent** - 3 aithemes
- **Partnering Game** - 6 Aims
- **The Imitation Game** - 0 Aytms
- **Child's play with objects** - 9 aithemes
- **Solo Game** - 3 Aims
- **Child's game with imaginary objects** - 3 aithemes
- **Communication Game** - 5 Aytms
- **Language Development Game** - 3 Aytms
- **Role Playing Games** - 5 Aytms
- **Playing at mealtimes** - 2 aithemes

1.4. PTESS scale - age 4

PTESS age 4 scale can be applied to examine children from 37 months to 48/54 months. Here, the criteria of partner play and play during feeding are dropped due to reaching the age of performance. Feeding a child at 36 months is considered a conscious act of social communication (Morris & Klein, 2000). The new criteria added are derived from the previous seven from age 3 years. The scale examines 38 athemes.

1.4.1. Criteria

The PTESS age 4 scale addresses the following categories of games:

- **Child's play with the parent**
- **Child's play with objects**
 - Subcategory Solo play
- **Communication Game**
 - child's play with imaginary objects
 - Subcategory Language Development Game
 - Subcategory Role-playing game
 - **Strategy Games sub-category** - this is the last sub-category added and has a direct link to the child's learning skills and their ability to strategize to solve a given situation and build a learning strategy (Landreth, 2023).
- **Play at mealtimes**

1.4.2. Items

The PTESS age 3 scale contains 3 aithemes divided into the following categories:

- **Playing the child with himself** - 0 aithemes
- **Child's game with the parent** - 3 aithemes
- **Partnering Game** - 0 Aims
- **The Imitation Game** - 0 Aytms
- **Child's play with objects** - 9 aithemes
- **Solo Game** - 3 Aims
- **Child's game with imaginary objects** - 3 aithemes
- **Communication Game** - 6 Aytms
- **Language Development Game** - 9 Aytms
- **Role-playing games** - 3 Aytms
- **Strategy Games** - 2 Aims
- **Playing at mealtimes** - 0 Aytms

2. Methodology and results of the study with PTESS scales

The PTESS scales are administered in a play situation in the presence or absence of a parent (depending on the child's adaptive capacity). The method of observation without comment (independent observation) is used. Didactic material from Pumpelina's Educational and Therapeutic System, described in Chapter One, is available and the steps outlined are followed. Each task needs to be presented in two different play situations. The study is conducted in a minimum of 4 sessions of 60 to 90 minutes per session.

In contrast to existing methodologies for examining child development, the PTESS scales examine the so-called developmental level across ages. Relative to the child's date of birth, the child's calendar (CC) age is determined. In the case of birth before 38 years of age, the so-called adjusted age is also determined, the adjusted age is only significant up to the age of 18 months (relative to the adjusted age - RAA). This refinement in age is related to the development of the nervous system, which ends at 18 months, as well as to the emergence and upgrading of primitive reflexes.

After the determination of the CC and RAA, the study continues with this scale, which analyzes the resulting age. Each attribute of the scale is scored with three possible scores:

- If the task is proven correct after two attempts in different situations, a score of 1 is given.
- In case of inconclusive after two attempts in a different situation correct performance of the task is given a score of 0.5. An inconclusive performance may be presented in one or more of the following situations
 - Understands the instruction, does not understand the sequence
 - Understands instruction, lacks independent performance skills
 - Understands the instruction, performance is possible after demonstration or in joint action with the investigator
 - Understands the instruction, starts, but gives up and needs to investigate further the reason for this behaviour
- Failure after two attempts in a different situation results in a score of 0.

Each category is evaluated by the sum of the scores obtained from the performance of the aithyms. A 100% performance is considered to be the maximum number of points. When the result of the scores in a category is equal to or less than 50 %, the investigator offers didactic material from the same category of game but for the previous age and starts investigating the aithyms from the category for the age one year younger. When the exploration of the athymemes from all required scales is completed, two scores are calculated.

Score one is the percentage coverage of the indicators for a given age according to the following formula:

$$\begin{aligned} \text{Total number of set points} &= 100\% \\ \text{Number of points} &= X \\ \text{We get the value of X by calculating} \\ & \frac{100 \times \text{the number of points obtained}}{\text{Total points}} \end{aligned}$$

Score two is important for compiling the child's level of development in the individual play categories. It shows the child's development and the gaps or overtakes they are demonstrating and is the basis for drawing up a possible individual therapy plan.

III. Validation data from the implementation of the PTES Game-Based Learning Programme and the PTESS Game-Based Learning Skills Assessment Scales

The initial approbation (Iordanova, 1999) of the **PTES Play-Based Learning Program** was carried out after monitoring its impact on 20 children with normal development, 10 children with sensory-integrative dysfunction, 10 children with developmental dyspraxia, 10 children with autism, 10 children with genetic disorders, including 1 child with Treacher-Collins, 1 child with Pierre-Robin, 1 child with Prader-Willi, 2 children with William-Byron, and 5 children with Down syndrome.

The first survey of children was done in March 2008, follow-up in March 2009 and March 2010. The final construction of the PTESS scales for assessing learning through play skills was implemented in 2011. All children were followed up for two years. The children ranged in age from 18 months to 7 years and were followed for two calendar years with the same organization of the PTESS scales.

Assessment of child development is a complex and responsible process involving the development of a strategy to stimulate development or correct delays. Each child's development is unique, dependent on neurodevelopment and interaction with the environment, which transforms basic reflexes into skills. Measuring development across phases, analyzing priorities and needs, and adequately assessing parental expectations are key to designing an effective plan to support the child (Iordanova, 2009).

2. Results of administering the PTESS Play-Based Learning Skills Rating Scales to children with development within the norm for age at the time of validation:

From 2010 to 2024, a total of 8872 children were studied, 6153 of them in the age group 0 to 7 years and followed up longitudinally for a period of 1 to 3 years. On the basis of the results obtained from the assessment scales, an individual therapeutic program was developed for each child.

Distribution of the examined persons by sex:

| Деца | бр. |
|-----------------------|-------------|
| деца от 12 м | 2716 |
| деца от 12 м. до 24 м | 1322 |
| деца от 24 м до 36 м | 954 |
| деца от 36 до 48 м | 814 |
| деца 48/54 м | 347 |
| Общо: | 6153 |

The data presented are only informative and relevant to the application of the Play-Based Learning Skills Rating Scales in therapeutic practice and their validation. The children studied were both developmentally normal and had various manifestations of delay or medical diagnosis. All the children studied had undergone a course of therapy and were assessed before the beginning and after the end of therapy.

3. Prerequisites for verification and digitisation of PTESS

After careful analysis of the data collected up to 2023 from children-clients who visited Pumpelina Speech Therapy Clinics in the years 2010 to 2022 inclusive, it was found that the prerequisites were in place to start a procedure to conduct verification and digitization of PTESS. The total number of children studied was 8456, of which 5737 cases were in the appropriate age range for analyses from 0 to 7 years (Iordanova, 2022).

| Полово разпределение | бр. |
|----------------------|-------------|
| момчета | 4769 |
| момичета | 1384 |
| Общо: | 6153 |

In the first stage of the analysis, the requests from the parents' consultation with a speech therapist were examined and then grouped into the following groups:

1. **Delay in speech, communication or language development after the child's second year** - 35% of requests.
2. **Delay in speech, communication or language development after the child's third year** - 35% of requests.
3. **Feeding problems** such as dysregulated swallowing and chewing, dysphagia and odynophagia, and tube feeding - 20% of the requests.
4. **Delay in social communication and talking** after the child's first year - 15% of requests
5. **Specific language disorders** - 5% of requests.

During the analysis (Iordanova, 2023), a very interesting change was found in the type of parents' requests for speech therapy consultation in the years **2020, 2021 and 2022**. The total number of parents for these years was 395, and 277 of them, or 70%, sought consultations for children aged 0 to 7 years. The following distribution of parental concerns was observed:

- ✓ Delay in speech, communication or language development after the child's second year - 45% of requests;
- ✓ Delay in speech, communication or language development after the child's third year - 10% of requests;
- ✓ Feeding problems such as dysregulated swallowing and chewing, dysphagia and odynophagia, and tube feeding - 30% of the requests;
- ✓ Delay in social communication and talking after the child's first year - 15% of requests.

The developmental level of all children was determined with the existing PTESS Play-Based Learning Ability Scale. A control assessment of all children's development was made with the MFED (Munchner Funktionelle Entwicklungs Diagnostik).

In the second stage of the analysis, the age of the children for whom the indicated requests for consultation with a speech therapist were submitted, the developmental level of the children and the time from the submission of the request to the start of speech therapy were examined. Due to the total change in living conditions with the emergence of the COVID pandemic, only the results of the last three years - 2020, 2021 and 2022 - were taken into account.

The results described below were obtained from all 277 children, distributed across the relevant ages (Iordanova, 2022; Iordanova, 2023):

Aged between 26 and 40 months with a developmental age between 12 and 24 months (45% of all children):

- Only 25% of these children started live speech therapy within 1 month of the consultation;
- 50% of the parents said they were worried about the COVID situation and preferred to have regular consultations with a speech therapist once a month through telepractice;
- 25% of parents never returned for follow-up of the child.

Ages 3 to 5 years with developmental ages between 1 and 3 years (10% of all children):

- 50% of these children started live speech therapy within 1 month of the consultation;
- 10% of the parents said they were worried about the COVID situation and preferred to have regular consultations with a speech therapist once a month through telepractice;
- 40% of parents never returned for follow-up of the child.

Ages between 3 months and 4 years with different feeding dysregulation Only 5% of them with articulation deficit (30% of all children):

- 100% - All children started speech and feeding therapy live within 1 month of consultation.

Ages between 18 and 24 months with a developmental age between 12 and 18 months (15% of all children).

- 60% of these children started live speech therapy within 1 month of the consultation;
- 40% of the parents said they were worried about the COVID situation and preferred to have regular consultations with a speech therapist once a month through telepractice.

The evidence and analyses presented highlight the importance of systematic assessment of child development and support the idea of developing a digital tool for parental self-assessment of child development. Structured environments promote child development by providing children with the opportunity to act freely within certain rules that promote academic ability (Aufenanger, 2019; Blanch et al., 2021). Learning through play has been shown to be the most effective method of engaging children at an early age, with additional stimuli and motivation being beneficial after year eight (Geringer, 2011; Hendricks & Petty, 2016). Therapeutic interventions follow this approach, and understanding it is key to successfully addressing a variety of maladaptive behaviors, play, and skill acquisition.

Chapter Three: Methodology, Stages, Procedure and Results of the Study

Introduction

The thesis of the dissertation is to prove through verification the effectiveness of the author's method for assessing learning skills through play (PTESS - Pumpelina Therapy and Education System Scales), as well as to develop and appropiate its digital version for the needs of professionals and parents, providing the possibility of preparing practical training programs for the family, based on the results of the PTESS scales and conducting effective and timely therapy.

This dissertation is a verification of the author's system for the assessment of learning skills through play PTESS, created in 2011 and the implementation of its digitalization for use by professionals and parents, supported by the author's program of social psychological training and monitoring for parents - families and cohabiting couples. The individual chapters provide a theoretical grounding of early childhood development and the place of play in it; of the structure of the PTES program and the PTESS scales for assessing learning skills through play, a description of the results of the verification of the method by correlation analysis with another scale provided, a factor analysis of the PTESS scales, and an author's therapeutic training program with monitoring to support digitalization as a way of using the PTESS scales.

The objectives of this dissertation are to verify the currently existing scales for the assessment of learning skills through play; to propose a digital platform for their use, accessible to both professionals and parents and to demonstrate the benefits and necessity of self-assessment of the child's abilities by the parent as a prerequisite for timely speech therapy. The latter was realized by conducting a study on monitoring and social psychological training for parents. The proposed model provides the parent with social and communicative competencies and skills without questioning the readiness to perform this complex life role.

To achieve this goal, the following **tasks** are set:

1. To verify the results of the application of the PTESS game-based learning skills assessment scales.
2. To produce a comparative analysis of the results of a study of 450 children aged 0 to 4 years with concurrent developmental assessments using the PTESS and Munich Functional Diagnostic of Developmental Skills Assessment Scales for Learning Through Play.
3. To implement a factor analysis of the PTESS scales.
4. To digitize and validate the PTESS game-based learning skills assessment scale.
5. To analyse parent self-assessment data through the PTESS digital platform
6. To produce a literature review offering options for developing a monitoring and training programme for parents.
7. To develop a practical rationale for the need for monitoring and parent training.
8. To conduct an experiment proving or rejecting the usefulness of using parent self-assessment scales as a means of initiating timely speech therapy. The competencies to be learned by the participants were imposed by market demand and defined in relation to the needs of the users.

The object of this dissertation research is the use of the PTESS scales as a diagnostic and therapeutic platform.

The subject of the study is the possibility of building a therapeutic strategy based on the results obtained from the applied PTESS scales.

The study is oriented to test the following **hypotheses:**

Hypothesis #1:

If the results of the comparative analysis between the subjects with PTESS and Munich Functional Diagnostic of Development found a similar result between the two scales, then the verification of PTESS can be considered successful.

Hypothesis #2:

The use of the PTESS scale to assess play-based learning skills in children aged 0 to 4 years provides a reliable and valid tool for measuring cognitive, social and motor development, contributing to parents' better understanding of the child's condition and supporting early childhood development and timely initiation of speech therapy.

In the process of realization of the theoretical-empirical research the following groups of methods were used:

1. Methods for data collection on the research problem: child development rating scales, parent self-assessment questionnaires, parent questionnaires for data collection on the research problem
2. Methods for mathematical and statistical data processing - correlation analysis, frequency analysis and factor analysis.
3. Historical method
4. Comparative method
5. Survey method
6. Monitoring
7. Social-psychological training

For the development of the dissertation and to prove the above hypotheses, the following **research questions** are posed:

1. What is the effectiveness of the PTESS scale for assessing play-based learning skills in children aged 0 to 4 years?
 - What are the main indicators by which children's play-based learning skills are measured?
 - What are the differences in assessments of play-based learning skills based on a child's age and gender?
 - What are the results of the comparative analysis between PTESS and other assessment methods, such as the Munich Functional Diagnosis of Development (MFED)?
2. What are the benefits of digitizing the PTESS scale for use by professionals and parents?
 - How does the digitisation of PTESS make the assessment process easier for professionals and parents?
 - What is the feedback from users of the digital self-assessment platform?
 - What are the main technical challenges in implementing the digital platform?

3. What is the relationship between early parental self-assessment and the success of timely speech therapy?
 - How does parental self-assessment influence the initiation of speech therapy?
 - What are the results of the experimental study on parents who used the digital self-assessment platform?
 - What is the role of social psychological training for parents in supporting early childhood development?
4. How do different types of play affect the cognitive, social and motor development of children aged 0-4 years?
 - What types of games are most effective for developing different skills in children?
 - How does the game contribute to sensory integration and the development of language skills?
 - What are the observed developmental differences in children who participate in different types of play?
5. What are the socio-economic factors that influence the effectiveness of the PTESS scale?
 - How does the socioeconomic status of the family affect the PTESS assessment results?
 - What are the differences in PTESS scores for children from different socioeconomic backgrounds?
 - How do socio-economic factors influence access to and use of the digital self-assessment platform?

I. Stages and procedure of the study

1. Preparatory stage

The preparatory phase consists of three conditionally defined phases and runs from March 2019 to May 2021. During this period, the conceptual framework of the study is established, the scope of the study is defined, the study design is defined and a target group survey is initiated. A target age of the study population is defined as between 0 and 48/54 months. The age of the individuals is related to the scope of study of the PTESS methodology to be verified in this chapter of this thesis. The instruments for conducting the study are being developed. An online platform with the ability to conduct a parenting self-assessment of families with children aged 0 to 24 months is being designed and built.

2. Pilot study stage

The pilot study (Iordanova, 2023) contains four phases and covers the period from the beginning of September 2021 to August 2022. During this phase, the Child Development Assessment Scales through Play is prepared for verification. A survey is conducted on the developed parent self-assessment scales. The target group of children conducts a survey with diagnostic encounters using the Pumpelina system. The PTESS scales were used to assess learning skills through play. Based on the information gathered from the parent survey on the use of the self-assessment scales, modifications to the proposed methodology of the self-assessment scales are made and used during the actual study.

3. Stage of the actual research

It consists of four phases of implementation: conducting a control study of the target group of children with the Munich Functional Diagnostic of Development; collecting a database

of parents of children aged 5 to 12 months through parent self-assessment scales; conducting therapy sessions using a one-type model with remote monitoring; organizing and conducting final sessions with parents to discuss the results.

4. Analytical stage

This stage has two main phases related to the processing and analysis of the obtained data. Primary statistical processing of the data was carried out, data obtained from the target group survey were compared with PTESS and MFED methodology. Correlation analysis was performed and the data obtained were correlated with each other. Factor analysis of child development through play assessment scale was done.

The process of interpreting the results and formulating the conclusions of the actual study begins.

II. Methods and Instrumentation of the PTESS Scale Verification Study

For the purposes of the empirical study, two equivalent methodologies were used to examine child development. Both methodologies indicate, through a different type of assessment, the developmental age of the subject and provide the possibility of designing a therapeutic program.

1. MFED Munich Functional Diagnostic of Development

Munich Functional Diagnosis of Development is the theory on which the PTESS scales were developed. MFED is described in detail in [Chapter One](#). It was chosen for comparison in the verification process because at the time the PTESS scales were developed, the Denver II diagnostic scale was not known for use in Bulgaria. In order to prove or reject hypothesis 1, it was deemed necessary to perform the verification as a comparison between the PTESS and the MFED.

The results obtained up to 12 months of age according to the requirements of the methodology represent an estimate in the range of 100% of the norm. Tolerance within the broad norm for age 30 days.

The results obtained up to 48/54 months of age according to the requirements of the methodology represent a score in the range of 50% norm and 90% norm for each age assessed. The tolerance within the broad norm for age ranges from 2 to 4 months. The variance is tolerable due to the influence of the organized environment offered in institutions for the care and education of children at this age. For the purpose of this dissertation, a score to the 99% norm for each age was calculated for all individuals studied.

2. PTESS - Scales for Assessment of Child Development through Play

PTESS is a method for assessing learning opportunities through play, described in detail in [chapter two](#) of the thesis. It covers four ages from one month to the end of the child's fourth year of life -48/54 months. As described in chapter two of the thesis the results obtained are calculated as a percentage against a 100% norm for each age. Tolerable deviation is within one month for the age up to 12 months and between and two and four months in the age from 24 to 48/54 months due to the influence of the educational environment and the presence of socio-cultural factors such as the background of family members such as nationality, religious

understanding, educational background of family members, involvement in child rearing of additional persons - extended family members (grandparents) or a helper in child rearing.

For the purposes of this dissertation, 461 individuals aged 6 months to 58 months were studied. Parents of all children studied reported (to their own understanding) a lack of disturbing observations in their children's development.

3. Methods for processing and analysis of verification data

The choice of methods is the result of a preliminary detailed analysis of theoretical descriptions and previous research on the possibilities and limitations of research methods and their applicability to the objectives of the specific study. After the research, we decided on a combination of complementary methods, which we divided into two groups according to their functionality: 1) methods for collecting information and 2) methods for processing and analyzing the collected information. For each of the selected methods a corresponding toolkit has been developed to facilitate the practical application of the method.

3.1. Correlation analysis

Correlation analysis (Archdeacon, 1994) is a statistical technique used to measure and evaluate the strength and direction of the relationship between two variables. This method helps determine whether and to what extent variables move together (i.e., if one variable changes, does the other tend to change in a predictable manner?) and is often represented by a correlation coefficient. Conducting a correlation analysis involves:

Correlation analysis provides insight into potential relationships between variables and is an essential tool in fields ranging from science to business. However, interpretation of correlation must be done carefully, always taking into account the broader context and potential third variables or confounders.

3.2. Factor analysis

Factor analysis (Gorsuch, 2014) is a statistical technique used to identify underlying factors or constructs that explain patterns of correlations between a set of observed variables. It is commonly used in fields such as psychology, social science, finance, and marketing to reduce a large number of variables into a smaller set of meaningful, interpretable components, often referred to as "factors." This reduction helps simplify data analysis, uncover hidden patterns, and improve understanding of the underlying structure in the data.

The development of factor analysis includes goal setting, data analysis, factor extraction with principal component analysis and principal axis factoring (generalized factor analysis), factor count determination, factor rotation, factor interpretation, and model validation.

Factor analysis is powerful for simplifying data and uncovering hidden structures, providing valuable information for theory building, research, and practical applications in multiple fields.

4. Participants - examinees, in the process of verification of the PTESS scales

For the verification of the PTESS scales, 461 children were examined, including 31 boys and 150 girls of calendar age 5 months to 54 years. The age distribution is given in the following table:

| children - age distribution | |
|------------------------------------|------------|
| children from 5 m to 12 m | 43 |
| children from 12 to 24 years | 92 |
| children from 24 m to 36 m | 190 |
| children from 36 to 48 m | 95 |
| children 48/54 m | 41 |
| Total: | 461 |

All children are recruited randomly through a voluntary request by a parent to the Pumpelina Speech Therapy office. Particularly noteworthy was the number of volunteer children aged 24 to 36 months. An important prerequisite for inclusion in the study sample was the explicit consent of study participants. All research subjects gave informed consent through a specially designed document - a declaration attached in [Appendix 8](#) of the thesis and were informed in advance of the planned activities at the relevant stage of their involvement in the study.

5. Analysis of the results of the PTESS scale verification process

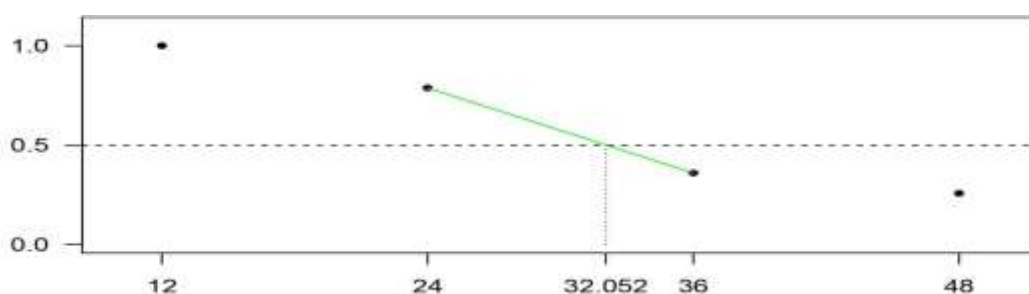
5.1. Correlation and regression analysis

After processing the data obtained from the study of the target group of children with two methodologies, PTESS and MFED, we proceeded to build a methodology for calculating the age of development of each person studied. Based on this age BP, correlation and regression analyses were constructed.

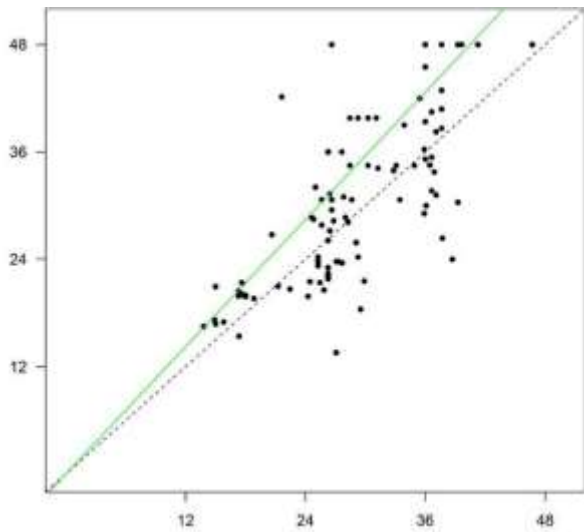
The following procedure was used to determine the PTESS age:

For each age (1, 2, 3, 4 years), the fraction of points obtained by the respective individual as a percentage of the maximum possible number of points for that age was determined. If a score above 50% is obtained for all ages, we can assume that the age is 48 months (4 years). If no values above 50% are obtained for any of the ages listed in the PTESS, we can assume that the age is less than 12 months. Since the proof of **Hypothesis 1** of this thesis requires the study of a target group of children functioning within the broad norm for each age, those individuals with scores below 50% across all ages are not included in the analysis.

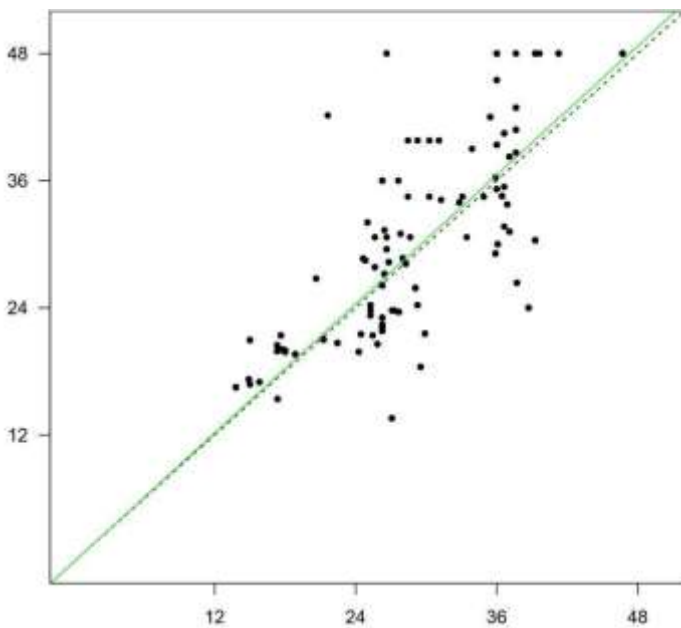
In other cases, the calendar age for which a score above 50% is found is used to determine the age BP, and the value for the next calendar age is 50%. For each of these two ages, the points are considered with the abscissa the corresponding age and the ordinate the corresponding score. A straight line is drawn through these points and the age BP is determined as the abscissa of the intersection of this straight line with the horizontal line corresponding to the 50% level. This is shown on the graph, in which case the age is defined as 32.052 months.



The MFED scale defines two ages of BP development - corresponding to the 50th and 90th percentiles of the distribution of the respective score value. Therefore, we initially compared the age determined by the PTESS scales with each of these two ages. The first plots show R^2 (squared) (Revelle, 2024) and the linear regression coefficient of age on PTESS as a function of the 50th and 90th percentiles on MFED without a free term. It can be seen that the new system assigns a slightly higher age than MFED (on average by about 18.5% and 11.8%, respectively), with a larger difference observed when comparing the 50th percentile. Therefore, we estimated the 99th percentile of the MFED age distribution (when approximating the distribution with a Gaussian/normal distribution) and compare with that as well. In the last plot, we see that the regression coefficient in the comparison with the 99th percentile is 1.0147, i.e., the estimated value under PTESS differs by only 1.47% from the estimated value of the 99th percentile MFED. We can conclude that since the regression coefficient is very close to 1, the PTESS scales model the 99th percentile MFED very closely.



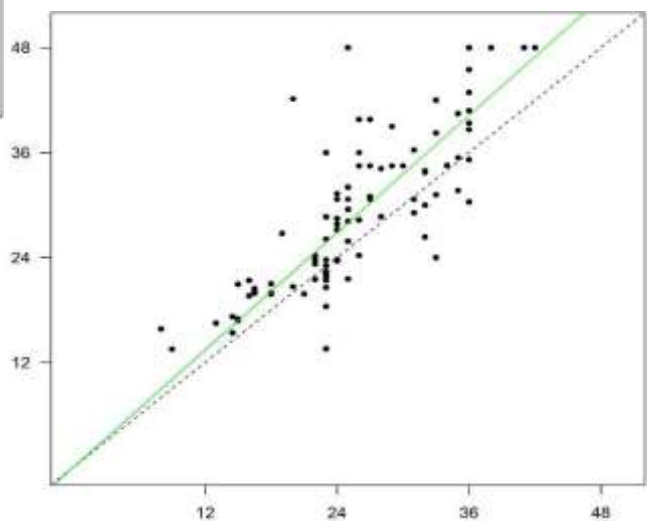
coefficient in the comparison with the 99th percentile is 1.0147, i.e., the estimated value under PTESS differs by only 1.47% from the estimated value of the 99th percentile MFED. We can conclude that since the regression coefficient is very close to 1, the PTESS scales model the 99th percentile MFED very closely.



In the results of the linear regressions of the plots shown, the abscissae of the plots show the MFED age values, the ordinates the PTESS values. The dotted lines show the diagonal ($y = x$) and the green solid lines show the regression line.

Note that in most cases of linear regressions with real data R^2 is much less than 1 than in our regressions, but this is because in most cases one variable is modeled as a function of the other. In our case, the two variables are directly related and are proxies for age.

The attached table shows the comparison of ages at the 50, 90 and 99 percent.



| Comparison with the corresponding MFED rate | Regression coefficient | Adj R ² | Correlation |
|---|------------------------|--------------------|-------------|
| 50 | 1.185705 | 0.9772 | 0.8876806 |
| 90 | 1.118169 | 0.9741 | 0.8712833 |
| 99 | 1.014700 | 0.9629 | 0.8080867 |

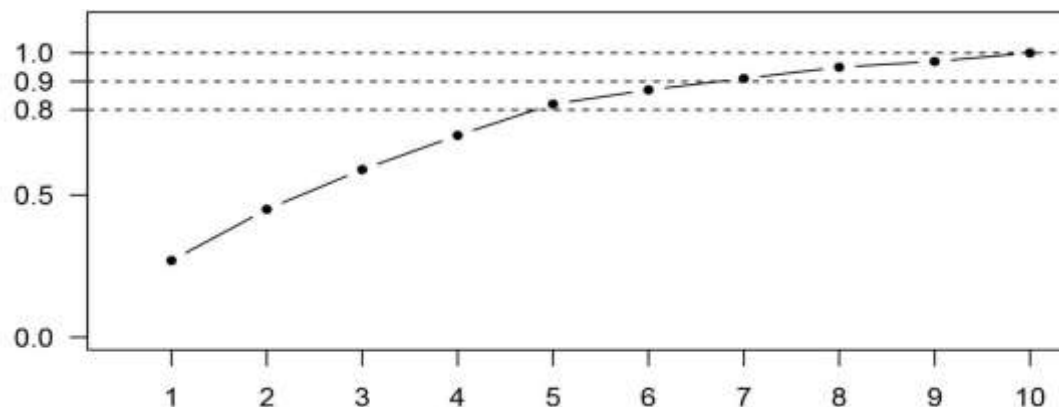
It is noteworthy that there are many observations (individuals) for which the values for each of the two scales are the same. There were 24 individuals for whom the 99th percentile MFED was measured as 36 months and the PTESS assigned an age of 48 months for each; 20 individuals for whom the values were 46.71 and 48, respectively; 13 individuals with values of 29.08 and 25.87; another 13 individuals with values of 27.26 and 23.75, respectively; and another 13 individuals with values of 13.82 and 16.5. This demonstrates the systematicity of PTESS as a method, although the values by the two methods are not always very close.

4.2 Factor analysis of PTESS

For the purposes of factor analysis (Jennrich, 2005), all the athymemes of the four ages that the scales examine are considered, using for brevity designations of the form X.Y, where X (= 1, 2, 3, 4) indicates the year being examined and Y is the ordinal number in that year. One attribute is ignored since its values are constant across individuals.

The William Revelle package (Revelle, 2024) (2024) was applied in the development of the factor analysis. Psych: Procedures for Psychological, Psychometric, and Personality Research. Northwestern University, Evanston, Illinois. R package version 2.4.3, using the correlation matrix, varimax parameter rotation, "pa" factorization method (i.e., fm="pa", principal [factor] analysis), and default values for the other parameters. The following parameters are used `r=cor(mydata)`, `rotate="varimax, fm="pa"`, and `nfactors` takes different values shown below.

Figure 5 shows the fraction of the variance of the data along the ordinate described in total by a number of factors whose value is shown on the abscissa. It can be seen that 5 factors describe over 80% of the variance, 7 factors describe over 90%, and 10 or more factors describe almost all of the variance. Analysis of the factor loadings, however, shows that the factors after the 4th factor do not include very many of the aitemes with weights that are largest for that aitem. Therefore, it only makes sense to consider 4 factors. In the above diagram the variation of the data along the ordinate is shown:

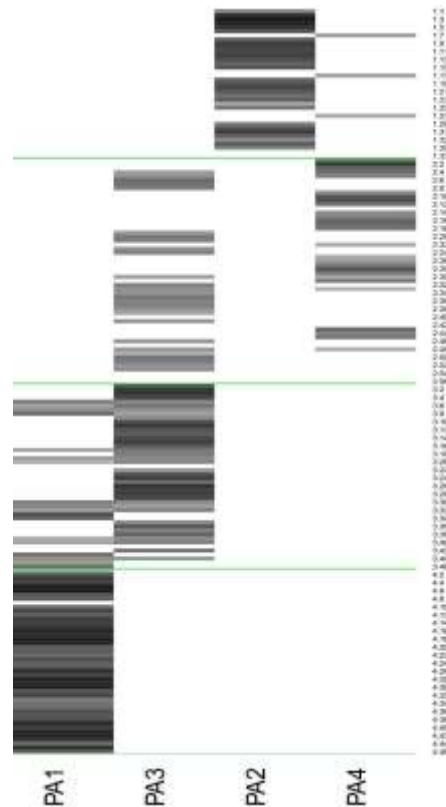


The results are reported in Table 21 and visualized in Figure 6 Factor weights that (in absolute value) are less than 0.5 have been removed as they are not significant. We can note the observation that almost all the aitems belong to only one factor. The exceptions are 2.4, 2.5, 2.30, 2.33, 2.48, 3.5, 3.6, 3.7, 3.8, 3.17, 3.19, 3.20, 3.30, 3.31, 3.32, 3.39, 3.40, 3.44 for which there are 2 factors with similar (and greater than 0.5) weights, as well as 1.16, 1.26, 1.28, 1.36, 1.37, 2.13, 2.40, 2.42, 2.47, 2.54, 2.55, 2.56, 3.21, 3.41, 4.9, for which there is no factor with a sufficiently high weight. As we can see from the table and the heat map (Warnes & Bolker, 2024), almost all the fourth year antecedents are in the PA1 factor, almost all the third year antecedents are in the PA3 factor, and almost all the first year antecedents are in the

The results are reported in the table presented in [Appendix 9](#) and are visualized in Table Factor weights that (in absolute value) are less than 0.5 are removed as they are not significant. We can note the observation that almost all the aitems belong to only one factor. The exceptions are 2.4, 2.5, 2.30, 2.33, 2.48, 3.5, 3.6, 3.7, 3.8, 3.17, 3.19, 3.20, 3.30, 3.31, 3.32, 3.39, 3.40, 3.44 for which there are 2 factors with similar (and greater than 0.5) weights, as well as 1.16, 1.26, 1.28, 1.36, 1.37, 2.13, 2.40, 2.42, 2.47, 2.54, 2.55, 2.56, 3.21, 3.41, 4.9, for which there is no factor with a sufficiently high weight. As we can see from the table and the heat map (Warnes & Bolker, 2024) almost all of the fourth year antecedents are in factor PA1, almost all of the third year antecedents are in factor PA3, and almost all of the first year antecedents are in factor PA2. The second year athymes are split between factor PA4 (which does not include athymes from other years) and factor PA3. The factor weights are shown in Table 21, in the Appendix.

The correspondence of the aytems and their abbreviated designations is given in the following table in [Annex 9](#).

The attached graph is a heatmap that visualizes the results. Factor weights that (in absolute value) are smaller than Figure N 6 is a heatmap that visualizes the results. Factor weights that (in absolute value) are less than 0.5 are coloured white. The darker the colour of the graph, the higher the factor weight. The green horizontal lines separate the averages for the different years. Noteworthy is the result indicating factors RA1 and RA4 as deterministic for the years - RA4 for the first year, RA1 for the fourth year, respectively, while factors RA2 and RA3 are observed as manifest in both the second and third years. This result finds an explanation in the manifestation of the crisis of the third year of the child's life, which represents a rapid development of the self and is characterized by high manifestations of autonomy. In relation to the evolutionary development of humanity, authors such as Penelope Leach (Leach, 1984), Sanda Winkler (Winkler, 2022), and John Santrock (Santrock, 2013), point to the possibility of entering the crisis between the ages of two and three, depending on the influence of the family and educational environment on the child. This explanation can be accepted as a reasonable prerequisite for the manifestation of factors RA2 and RA3 in both the second and third year of the child's assessment.



5. Contributions and conclusions of the empirical study

The overall conception and design of the empirical study, and in particular the selection of methods and instruments, verify and prove the validity of the previously formulated **hypothesis No. 1** in the dissertation, namely: **if the results of the comparative analysis between the subjects with PTESS and Munich Functional Diagnostic of Development are found to be similar between the two scales the verification of PTESS can be considered successful.**

The described model of children's play development can be accepted as a **theoretical contribution** of the doctoral student, and the applied PTESS methods and scales as a practical contribution to the development of speech therapy theory and practice in Bulgaria.

1. The empirical data obtained lead to the conclusion that the research **hypothesis #1** previously formulated in the dissertation is confirmed.
2. The results obtained from the correlation and regression analyses performed between the PTESS and Munich Functional Diagnostic of Development scores were extremely close in the 99th percentile and the verification of PTESS can be considered successful.
3. A factor analysis was performed to show that the amythmys associated with the first and fourth years are associated with two different factors, respectively, and the amythmys associated with the third year are the most important in another factor, and there is another factor associated with the crisis of the third year of the child's life, which includes amythmys from the second and third years.
4. Of interest would be a follow-up empirical study establishing the influence of the environment on child development, with a view to modifying the atemic scales and their location for assessment at an earlier or later age as indicated in the present PTESS scales.

III. Methods and tools for conducting PTESS scale digitization

1. Introduction

The second part of the planned dissertation study is related to the feasibility and describes the steps of building the functionality of the digital version of the PTESS toolkit and describes a study by applying a parent training and monitoring model to prove the usefulness of using the digital version of PTESS. **The aim, objectives, subject, object and hypothesis 2** formulated in the introduction refer to the construction of a platform with the possibility of being used by professionals for diagnosis and the elaboration of a therapeutic plan and by parents as a method of self-assessment of child development, as well as to the results of the implementation of the study.

2. Prerequisites for the digitization of the PTESS game-based learning assessment scales

To assess the need for parents to have a means of self-assessing child development, we reviewed child development consultation requests submitted to Pummelina by parents for their own children and implemented the following procedure:

1. We summarized parent requests for consultation by similarity of the parent's suspected problem or developmental difficulty with the child.

2. We summarized the developmental level assessments made for the children and summarized them as criteria of similarity to a demonstrated developmental problem or delay.
3. We summarized the length of delay between the date of the consultation and the time of initiation of the required speech therapy.
4. We summarized the types of therapy administered according to the type of developmental problem or delay demonstrated.

As a result of the preliminary research, the need to build a parent self-assessment platform emerged. The following tasks were set:

1. To track parental interest in this type of self-assessment platform by observing random responses.
2. To track parental interest in this type of self-assessment platform by observing responses received after recommending the platform.
3. To offer training to parents who have completed self-assessment scales when the scales show similar delays in child development.

The completion of the set tasks will lead to the verification of the hypothesis **No. 2** stated in the thesis, namely the **use of the PTESS scale for the assessment of play-based learning skills in children aged 0 to 4 years provides a reliable and valid tool for measuring cognitive, social and motor development, contributing to a better understanding and support of early childhood development and timely initiation of speech therapy.**

3. Development and functionality of the game-based learning skills assessment platform

The digital platform was developed according to a concept developed by the PhD student, presented on the basis of the summaries and needs assessment results. The functionality of the platform was discussed and approved for one calendar year.

The WordPress platform was used for the technical implementation and positioning of PTESS, after comparison with other popular content management systems (CMS) such as Joomla and Drupal, due to its user-friendly interface and ease of use, allowing for seamless user experience. Additionally, WordPress offers high flexibility and scalability, making it a suitable platform for projects that require the ability to adapt to changing needs and grow over time.

2.1. Structuring the platform for use by professionals

Access to the specialist platform is through an administrative panel called the backend, with restrictions on user access to the database. Each therapist is restricted to seeing only their own clients' ratings. The platform is built on WordPress using a specially developed add-on. Data collection is protected with special tools and requirements. User login is controlled by username and password. Parents do not have access to this platform. All 159 items are organized into four questionnaires - age one with thirty-four items, age two with 47 items, age three with 39 items: age four with 39 items. The starting point is the age of the child according to the date of birth.

2.2. Translation of the child development assessment scales through play for professionals in different regions

In order to make the questionnaires more widely used by professionals and in relation to the increasing requests for child development tracking from Bulgarian families living in the territories of Europe, the PTESS scales were translated into Greek and English (Iordanova, 2023). A verified and standardized translation of the items is an essential part of any survey. Incomplete or inaccurate translations can lose the meaning and significance that the team that created the survey intended or, in the worst case, change it completely. As a result, the scales could be misleading to the researcher or become invalid. The matching and validation process was carried out initially by individuals fluent in both languages, then by sworn translators, and finally by speech therapists practising in Greece and the UK. A total of 6 children were studied, ranging in age from 9 months to 3 years and 6 months. 3 children in the UK from mixed backgrounds - Bulgarian-English families and 3 children in Greece from mixed backgrounds - Bulgarian-Greek families. All six children were assessed with the PTESS digital scales in English and Greek, respectively. The same children were examined by telepractice with the PTESS scales in Bulgarian. In the comparison made, a complete agreement of results was found, whereby the translated versions can be considered reliable.

At the moment, the platform is ready for use in three languages - Bulgarian, Greek and English.

3. Functional description of a digital platform for parents' self-assessment of learning skills through play

The parent self-assessment platform is built on the PTESS Learning Skills Assessment Scales and has two different views - a user panel (frontend) that is visible to users who complete the parent questionnaires and an administrative panel (backend) that is only accessible to administrators. The backend allows administrators to create and manage quiz questionnaires for different age groups, as well as to analyse and download the results. The platform can be accessed at <https://www.pumpelina.bg> and the administration panel can only be accessed with a provided user and password via the service path.

5. Application of the PTESS digital learning assessment platform for professionals

The digital platform for the assessment of child development through PTESS scales for the assessment of learning skills through play is accessible through the administrative panel only for professionals. To date, 145 speech therapists have been trained to use the scales in the analogue, paper-based version. They are successfully using this type of child development assessment using the existing scales. 41 specialists, speech and language therapists and speech and language therapists trained in the Pumpelina Early Intervention Programme, have been trained to use the digital platform.

Each specialist is given a computer-generated access password that can be changed, but user verification is required to protect privacy. Each specialist only has access to the completed scales for their clients. Platform administrators have access to all completed scales in order to troubleshoot, prevent information leakage, and maintain the platform. Instructions for use are available through the administration panel. Appendix 11 of the thesis demonstrates screenshots of the functionality of the developed platform for digital use of the PTESS scales by parents and professionals

Both the scales and the instructions are available in three languages - Bulgarian, English and Greek. The translated scales are attached in [Appendix 6](#) and [Appendix 14](#) of the thesis. If necessary, the scales can be printed in the respective language of the parent or other professional. The platform is open for use by professionals who have received training from 01.03.2024 on As of 10.07.2024, data for children have been completed - 30 children aged up to 12 months, 10 children aged up to 24 months, 8 children aged up to 3 years and 6 children aged up to 4 years. 54 therapeutic programmes have been prepared respectively. All trained professionals eligible to use the digital version of the PTESS scales applied the results obtained under supervision in a period of 6 months after the completion of their training.

These professionals were also offered the use of the supplementary questionnaires for the assessment of feeding skills related to the last category of PTESS games - Play at mealtimes. These questionnaires are only available in English and can be found in [Appendix 11](#) of the thesis.

6. Conclusions

The digitisation exercise demonstrated the successful development and implementation of a digital version of the PTES platform, which aims to support both professionals and parents in monitoring and supporting early childhood development. The digital PTESS platform was designed as a response to the growing needs from parents seeking self-assessment tools to gauge their children's developmental stages. This need was identified through a preliminary analysis of consultation requests related to developmental delays, highlighting the importance of timely interventions and the potential of digital solutions to fill existing gaps in accessibility and ease of use.

The digitalisation of PTESS is a meticulously planned process, including platform selection, functionality testing and incorporating user feedback. WordPress was chosen as the platform due to its user-friendly interface, flexibility and wide range of plugins that allowed for cost-effective and rapid development. This choice balances ease of use with robust security measures, ensuring that parents and professionals alike can confidently use the platform without compromising sensitive data.

An important feature of the platform is its dual functionality, serving both parents and professionals through different interfaces. The parent interface allows for user-friendly self-assessment, while the specialist interface provides diagnostic and therapeutic planning tools accessible only through secure login credentials. The PTESS digital scales have also been translated into English and Greek to extend their reach to Bulgarian families living abroad.

The platform's integration of notifications, reporting, and data analytics improves its usability by offering professionals detailed information on development progress and enabling quick action when delays are detected. The results and reporting section further supports this functionality by allowing professionals to filter and analyse data by age group, assessment category and individual results. Visualizations such as pie charts and bar graphs help identify trends, which is invaluable for continuously improving child assessment practices.

Finally, the PTESS digital platform illustrates the future of developmental assessment by integrating technology with early childhood education, offering a scalable and adaptable tool that is accessible to a variety of users. As more professionals are trained to use this tool, its

potential to improve early detection and intervention efforts will only grow, ultimately contributing to better developmental outcomes for children.

This project highlights the importance of digital transformation in educational and developmental assessments, revealing promising avenues for future research and development in similar areas. The digital PTESS platform not only addresses current needs, but also sets a precedent for future innovations in developmental assessment and parent support.

The functionality of the developed platform proves the validity of the previously formulated **hypothesis #2** in the dissertation, namely: **the use of the PTESS scale to assess play-based learning skills in children aged 0-4 years provides a reliable and valid tool for measuring cognitive, social and motor development, contributing to a better understanding and support of early childhood development and timely initiation of speech therapy.**

IV. Methods and tools for conducting research through monitoring and social psychological training to support the use of the PTESS digitization scales for parents and professionals

In order to prove **Hypothesis 2** of this dissertation, namely the **use of the PTESS scale to assess play-based learning skills in children aged 0-4 years provides a reliable and valid tool for measuring cognitive, social and motor development, contributing to a better understanding and support of early childhood development and timely initiation of speech therapy**, the following author's concept for the implementation of monitoring and social psychological training for parents was developed. The needs indicated in the concept for the implementation of the different types of training were determined according to the client requests received in Pumpelina in the period 2010 - 2022.

1. The need for training parents of young children

In relation to the above thesis, the following groups and the corresponding training needs for parents can be identified:

- **Young parents group** (Age of partners up to 20 years)

This is a group that falls under the factor "Lack of experience and information".

- **Conscious parents group** (Age of partners between 20 and 30 years)

This target group falls under the Planning factor. These are parents who have basically set their priorities for career and academic development, but face the challenge of simultaneously fulfilling two socially significant roles - professional and parental.

- **Group of parents expecting another child in the family** (For those in this group, age is not essential, as the leading factor is dethronement)

Partners falling into this target group face the challenge of whether or not to accept another child from the other children in the family. These parents have experience, but at the same time make comparisons with the development and opportunities that other children have had at a certain stage in their lives.

- **Group of elderly parents** (Age of partners over 30 years)

In this group are distinguished partners who have already completed academic or career achievement and fall under the influence of the factor "Excessive information", which results in fear of not coping with parental commitments or leads to the transfer of personal ambitions on the future development of the child.

2. Specificity of training parents of children in early childhood

The desire for a child and the readiness to be a parent are the factors underlying the need for training. Neither of these two factors is to be discussed during the training as this would lead to the introduction of unacceptable assessments and conclusions for the training. It is of utmost importance that parents are interviewed and surveyed beforehand in order to track the following factors:

- Desire for the mother's child;
- Desire for the father's child;
- Presence of other children in the family;
- Desire of other children in the family for a next brother or sister;
- Age of parents;
- Parents' level of intellectual and social functioning;
- Cultural and religious understandings;
- Family status - mixed marriage, cohabitation, single parent.

Each of these factors identifies partners to a relevant target group, which contributes to the successful delivery of training and meeting needs.

Social-psychological training for parents has the following tasks, which lead to the formation of skills:

1. Mastering different aspects of communication between parents and children aged 0-12 months;
2. Parenting Behaviour Formation;
3. Learning practical knowledge and skills to stimulate verbal and non-verbal communication between parents and child;
4. Acquire practical knowledge and skills to stimulate parent-child interaction.

Training is the most appropriate and practical form of training for adults. Consideration should be given to the request of the participants as well as the developmental age of their children.

3. Study of the impact of monitoring and training for parents for individuals who have conducted a parent self-assessment through the PTESS digital platform

The parent self-assessment platform with the PTESS scales was opened on 01.09.2022 after a correction and reorganization of the questionnaires conducted through a control survey of 20 parents of children from 0 to 12 months. The results of the survey indicated ambiguity in the questions asked due to the use of professional terminology and necessitated a change in the style of asking them, as well as a reorganization of the structure of the questionnaires themselves, made at the suggestion of the control group of parents.

After adjusting the parent self-assessment questionnaires, the platform was opened for a three-month test period during which the data described below were collected from parents

willing to assess their children's development. The parents listed are not clients of the Pumpelina speech therapy office. The data is valid as of December 31, 2022 (Iordanova, 2022).

3.1. Description of users

Age 0-3 months:

Total questionnaires sent: 28. Average score - 17,95 of all questionnaires. In 23 of them the sex of the child was not indicated.

Results: 20 responses indicate normal development with a profile above 80% coverage of opportunities; 5 responses indicate a development profile within 60% coverage of opportunities; 3 responses indicate a development profile below 50% coverage of opportunities.

Conclusion: No negative feedback was received via the website email. Three families have used the website email to consult with professionals for further recommendations and to voice their concerns.

Age 3-6 months:

Total questionnaires sent: 19. Average score- 22.53 of all questionnaires

Results: 12 responses showed normal development with a profile above 80% coverage of the aythema; 2 responses showed a developmental profile at 80 to 60% coverage of the aythema; 2 responses showed a developmental profile within 60% coverage of the aythema; 3 responses showed a developmental profile below 50% coverage of the aythema. It is interesting to consider the child's play with objects and feeding games. Both are related to the development of movement and to the development of communication. This is the reason why we could observe a variety of different scores within 80% of normal development, but with variance in different categories of play

Conclusions: No negative feedback was received via email on the website. Three families have used the site email to consult with professionals for further recommendations and to express their concerns.

Age 6-9 months:

Total questionnaires sent: 21. Average score of 28.55 out of all.

Results: 15 responses showed normal development with a profile above 80% coverage of the aithemes; 2 responses showed a developmental profile at 80 to 60% coverage of the aithemes; 1 response showed a developmental profile within 60% coverage of the aithemes. 2 responses showed a developmental profile below 50% coverage of the aithemes.

The same variance in responses across game categories was found among the results in the 80% races .

Conclusions: No negative feedback was received via email on the website. One family has emailed the site to consult professionals for further recommendations.

Age 9-12 months:

Total questionnaires sent: 45. Average score - 23.86 out of all.

Results: 30 responses showed normal development with a profile above 80% coverage of the aithemes; 10 responses showed a developmental profile within 60% coverage of the aithemes. 5 responses showed a developmental profile below 50% coverage.

Due to the enormous influence of social communication and the child's ability to demonstrate shared attention, we could observe the different in the categories of imitation games, communicative games with a focus on speech-language development, and partner games. All of the abilities to participate in games were related to the social rules in the particular family, as well as reflecting mother-child interaction and family members' willingness to play with the child.

Conclusions: No negative feedback was received via the website email. 17 families have contacted the site via email with concerns for further recommendations and specialist advice.

Summary findings from the approbation period:

The reluctance of the parents to indicate the sex of the child is noteworthy. Also noteworthy is the high number of questionnaires received at the age of 9-12 months, at the expense of the younger ages. Due to the lack of negative feedback, we could consider the approbation successful.

3.2. Description of observed activity for use of the PTESS parent self-assessment scales

The data reported in this part of the thesis was collected and monitored from January 2023 to July 15, 2024. In the mentioned period, the platform was used by occasional parents and by parents, clients of Pumpelina speech therapy office. The following table illustrates the activity of use of the digital platform as an information source (in the examined part) and for self-assessment (in the completed part)

Total number of completed questionnaires

| | Examined | completed |
|--|----------|-----------|
| Възрастова скала 9-12 месеца – оценка на уменията за учене чрез игра | 33 | 1876 |
| Възрастова скала 6-9 месеца – оценка на уменията за учене чрез игра | 36 | 988 |
| Възрастова скала 3-6 месеца – оценка на уменията за учене чрез игра | 34 | 1074 |
| Възрастова скала 0-3 месеца – оценка на уменията за учене чрез игра | 22 | 10352 |

We observe an interesting phenomenon in the above results. The Parental Self-Assessment Questionnaire at age 0 to 3 months was seen, read, and presumably completed but not sent by **10352** people, and was completed and sent by only 73. The Parental Self-Assessment Questionnaire at age 3 to 6 months has been seen by 1074 people, and completed and sent by only 76. The parent self-assessment questionnaire at age 6 to 9 months was seen by

988 people, and was completed and sent by only 65. The parent self-assessment questionnaire at age 9 to 12 months was seen by 1,376 people and completed and returned by only 158. We could strongly conclude that concerns about child development are most visible in the age up to 3 months and in the age from 9 to 12 months. This fact has its own theoretical explanation (Bayley, 2005; Hellbruegge et al, 1994; Berk, 2012) - at the age of up to 3 months, the attainment of head control, visual tracking and feeding regulation is monitored with extreme accuracy by parents and professionals. While by the age of 12 months, crawling, crawling and crawling manifestations are observed, the early onset of which, delays speech development and leads to the formation of concerns about late talking. It is extremely important to assess that the parental self-assessment platform, even if used only informatively, by reading without sending the questionnaires, contributes to informing parents in a timely manner regarding their child's development and ways of communicating with him/her. The low activity of the questionnaires sent out could also be explained by the leakage of personal information instilled in the media spaces, which could lead to the predominance of informativeness over the actual use of the parental self-assessment questionnaires.

3.3. Description of the study

After careful examination of the data received from the completed questionnaires as of June 2023, we sent an unsolicited invitation to the emails provided by the parents, to the fraction of parents who indicated a delay in the Play at Mealtime category across the four age groups. A total of 150 invitations were sent, of which we received 136 requests for online consultation. The following procedure was implemented during the consultation:

- a. Making contact with the parent requesting the consultation
- b. Sending instructions for the consultation on Viber to the parent
- c. Review of materials sent by the parent
- d. Scheduling an appointment through Zoom
- e. Consultation within 30 minutes
- f. Proposal for tracking the child's defined developmental difficulties through monitoring
- g. Obtaining consent or refusal for monitoring

In order to validate the **hypothesis #2** of the thesis, namely the **use of the PTESS scale to assess play-based learning skills in children aged 0-4 years provides a reliable and valid tool to measure cognitive, social and motor development, contributing to a better understanding and support of early childhood development and timely initiation of speech therapy**, parents requesting a consultation after sending us an email were offered to participate in two forms of parent training:

Monitoring to stimulate feeding skills and play during mealtimes

Social-psychological training to improve parent-child communication.

Aim of the study: to provide timely speech therapy to improve feeding and play difficulties identified by parental self-assessment questionnaires in children aged 0 to 12 months.

Research platform - telepractice (Mihova, 2021; Mihova, 2023; Stankova, 2022).

Telepractice has been a form of therapy used in speech therapy practice since 2007. Initially in the then existing Pumpelina Virtual Parent Consultation Room, through a specially created platform. In the last few years, telepractice has been accepted as a regulated and reliable form of speech therapy (Therapists, 2020; Deleva, 2020; Harrison, 2011).

The following tasks were set:

1. To develop a monitoring scheme through telepractice for children aged 0 to 12 months to improve feeding and nutrition skills
2. To develop an Author's Program of Social-Psychological Training to improve communication between parents and child
3. During a requested consultation, after an email has been sent, parents should be offered the opportunity to engage in monitoring via telepractice their child's feeding.
4. After completion of the monitoring via telepractice, parents are offered to participate in a two-day live Social Psychological Training to improve parent-child communication.

3.3.1. First phase of the research - online consultations

As already indicated, a total of 150 invitations were sent, of which 136 requests for online consultation were received. Of the consultations conducted, 115 parents indicated a desire for continued speech therapy through monitoring to improve feeding and eating skills. Of these:

Gender - 74 boys and 41 girls

Age distribution - 32 children aged 0 to 3 months with feeding dysregulation. 10 girls and 22 boys. 28 children born between 38 and 40 gestational weeks and 4 children born before 38 gestational weeks with nasogastric probes inserted. 24 children aged 3 to 6 months with symptoms of nursing strike and disordered feeding mechanisms. Of these, 18 boys and 6 girls all born between 38 and 40 weeks gestation. 47 children aged 6 to 9 months with marked feeding disorders. 41 children born between 38 and 40 weeks gestation and 6 children born before 38 weeks gestation with various medical problems. 34 boys and 13 girls. And 12 children aged 9 to 12 months. 12 girls born between 38 and 40 gestational weeks. 14 families refused follow-up speech therapy without a reason for refusal being named.

3.3.2. Phase 2 of the study - conducting monitoring through telepractice of children aged 0 to 12 months to improve nutrition and feeding skills

For a meaningful monitoring exercise, two additional questionnaires on children's nutrition information were developed. A questionnaire on child feeding up to 6 months of age and a questionnaire on child feeding over 6 months of age. The questionnaires were integrated into the PTESS digital platform but are not accessible through the administrative panel for casual use. The feeding questionnaire for up to 6 months of age contained 31 questions and the one for over 6 months contained 20 questions. The questionnaires are sent to parents via a link that leads them to the front end of the platform.

As of 10.07 questionnaires have been completed by 117 families for ages 0 to 6 months and 138 families for ages 6 months and older.

| | | | | |
|---|----|-----|-----|--------------------------|
| Въпросник за хранене на деца над 6 месеца | 31 | 699 | 138 | June 7, 2024 10:39:45 AM |
| Въпросник за хранене на деца от 0 до 6 месеца | 20 | 642 | 117 | June 7, 2024 10:42:06 AM |

In order to realize the experiment more successful initiation for speech therapy after the completed parent self-assessment questionnaire, proceeded to send the nutrition questionnaires to all 115 parents who participated in the experiment. We then proceeded to administer via telepractice monitoring for children aged 0 to 12 months to improve feeding and feeding skills.

3.3.2.1. Author's scheme for monitoring through telepractice for children aged 0 to 12 months to improve feeding and feeding skills:

Monitoring objectives:

1. To establish the feeding rhythm of the particular child.
2. To change the rhythm and method of feeding from the parent to the child.
3. To change the structure of play between parent and child at mealtimes.
4. To improve the child's interest in food.

Means of monitoring:

For the implementation of the monitoring, observations were used through a presented video clip of the child's feeding skills, observation through a presented video clip of the communication between the mother and the child during feeding, presentation of a prepared feeding schedule - by the mother for the past time period and by the therapist for the upcoming time period. Telepractice was done through Zoom platform for consultative meetings is the beginning and end of monitoring and through Viber for exchange of information about feeding schemes, change of food composition, change of feeding technique, suggestion of play during feeding.

Initial consultation:

- Review the data from the history questionnaire sent and completed and medical records, if attached.
- Review the completed age-specific self-assessment questionnaire on the development of play-based learning skills.
- Review of parent completed feeding questionnaires
- Review the video information sent by the parent.
- Conduct a consultation via a zoom platform to establish the parent's expectations and the child's demonstrated capabilities.

After the initial consultation, all parents were asked to complete parent self-assessment questionnaires for previous ages only in the play at mealtime section.

First month monitoring:

Step 1

Within two calendar weeks, the parent sends a feeding schedule and amounts of food taken by the child, as well as type of food within 24 hours. The therapist only adjusts the food intake amount in the individual time zones. In the presence of night-feeding or breastfeeding on demand, the therapist suggests a regimen for avoiding night-feeding and discontinuing breastfeeding on demand. The therapist suggests a feeding schedule for the next 24 hours, starting at a specified time on the day of the exchange. The parent implements the feeding schedule received and sends new information to the therapist at the end of the 24-hour period, changing nothing in the feeding schedule until she receives the next 24-hour schedule from the therapist. If the circumstances are good, the parent has no anxiety about the child, the child

strictly follows the therapist's suggested feeding schedule, and the child successfully accepts the schedule, a maximum of 10 therapeutic schedules with 24-hour monitoring is possible within Step 1. The therapist does not introduce new foods or feeding accessories. Only the number of meals can be changed.

In the presence of screen dependence during feeding, do not proceed to its termination or reduction.

Step 2

Within two calendar weeks, the parent sends a feeding schedule and amounts of food taken by the child, as well as the type of food within 48 hours. Upon successful cessation of night feedings, the therapist proceeds to change the balance of caloric intake across time zones. New foods may be introduced, either in terms of texture or type of food, according to the child's age. It is permissible to switch from all-milk feeding to pureed feeding, or to thicken pureed food and switch to hand-feeding, depending on the age of the child.

The therapist suggests a meal schedule for the next 48 hours, starting at a specified time on the day of the exchange. The parent implements the meal schedule received and sends new information to the therapist at the end of the 48th hour, changing nothing in the meal schedule until the next 48 hour schedule is received from the therapist. If the circumstances are good, the parent has no anxiety about the child, the child strictly follows the therapist's suggested feeding schedule, and the child successfully accepts the schedule, a maximum of 7 therapeutic schedules with 48-hour monitoring are possible within Step 1.

If night feeding was unsuccessful, repeat the procedure from step 1 with 24-hour monitoring but with the introduction of pureed food for the feeding between 19 and 20 hours.

In the presence of screen dependence during feeding, it is not yet proceeded to its termination or reduction.

Second month monitoring:

Step 3

Within two calendar weeks, the parent sends a feeding schedule and amounts of food taken by the child, as well as type of food within 72 hours. New foods may be introduced, either in terms of texture or type of food, according to the age of the child. New feeding techniques may be introduced - side feeding, fork feeding, hand feeding - depending on the age of the child.

The therapist suggests a meal schedule for the next 72 hours, starting at a specified time on the day of the exchange. The parent implements the meal schedule received and sends new information to the therapist at the end of the 72-hour period, changing nothing in the meal schedule until the next 72-hour schedule is received from the therapist. If the circumstances are good, the parent has no anxiety about the child, the child strictly follows the therapist's suggested feeding schedule, and the child successfully accepts the schedule, a maximum of 4 therapeutic schedules with 72-hour monitoring is possible within Step 1.

In cases where nocturnal feeding has been completed, proceed to the implementation of the flowchart from step 2. When nocturnal feeding has not been successfully completed, monitoring is interrupted and proceed to an additional second consultation via the Zoom platform. Depending on the parent's understanding and wishes, two decisions may be made - termination of the therapy that has begun or referral of the parent to a speech and language

therapist, feeding therapist, or early intervention specialist whose practice is located near the family's location.

In the presence of screen time dependence, the therapist suggests playing with food, eating utensils, or other appropriate substitutes in order to reduce screen time during mealtimes.

Step 4

Monitoring continues at 72 hours. The difference with step 3 is the therapist's suggested innovation in the child's menu depending on the age - starting or continuing feeding at the age of up to 6 months in the time range around 12-13 hours, for children over 6 months - introducing pureed or chunky food in the time range between 19 and 20 hours, followed by milk feeding around 21-21.30 hours (after bath time). As a rule, only one new amendment is introduced every 72 hours.

Third month monitoring

Step 5

During this period, monitoring is carried out once a week. The parent sends via Viber a feeding schedule containing information on the type and quantity of food, as well as the duration and location of each feeding. The parent sends two types of video information - information during the meal and information about play before, during and after the meal. Moves to permanently remove screen dependency during mealtimes, if present. After reviewing the information sent, the therapist sends a suggestion for including a food, feeding method, or introducing a multi-component food, either in blended form or in bites, depending on the child's age and in the 12-13 or 19-20 hour time range, depending on the child's needs.

Final consultation

After the third month of monitoring, a final consultation is held during which the parent receives feedback on what has been achieved so far. There are two possible outcomes after the end of the monitoring - successful completion of therapy or transition from telepractice to face-to-face visits with a speech therapist, nutritional therapist, early interventionist whose practice is located near the family's location.

3.3.3. The third phase of the study - conducting Social Psychological Training for improving communication between parents and child

During the final consultation, the parents were offered to participate in a **social-psychological training** to improve communication between parents and child according to an author's program.

3.4. Results of the study

3.4.1. Results phase 1 - consultation

For the purposes of the present experiment to demonstrate the benefit of initiating timely speech therapy after completion of parent self-assessment scales of play learning skills, 115 initial consultation meetings were conducted. A total of 115 consents were obtained to initiate monitoring to improve feeding and play skills during mealtimes. 56 parents completed a feeding

questionnaire for children under 6 months and 59 parents completed both feeding questionnaires for children under 6 months and for children over 6 months.

The number of boys is approximately twice as high as that of girls.

To demonstrate the benefit of timely initiation of speech therapy after completion of parent self-assessment scales of learning skills through play, parent-submitted responses in the Play at Mealtime category were taken as a starting point. Because of the difference in the period of birth and the presence of medical difficulties in 10 of the children, the scores were assessed separately for the two groups of children: children born between 38 and 40 years of age with no evidence of medical problems at the time of initiation of monitoring and children born before 38 years of age with evidence of medical problems at the time of initiation of monitoring.

3.4.2 Results Phase 2 - Monitoring

Phase 2 was initiated in September 2023 completed on March 30, 2024. 115 families consented to **monitoring via tele-practice for children 0 to 12 months of age to improve nutrition and feeding skills**. A total of 3071 monitors were conducted via Viber, over 8 months, averaging 20 monitors per day, taking on average between 15 and 20 minutes per monitor. 25 parents discontinued monitoring at the end of step 3 due to non-compliance or disagreement with the proposed therapy. Ninety final consultations were conducted, during which feedback was given to the parents by means of parent self-assessment questionnaires on play learning skills, but completed by the therapist who conducted the monitoring.

The table shows the distribution of monitoring meetings held by age. It shows the number of meetings with both the families who have opted out and the number of meetings with families who have completed all steps of the monitoring.

| възраст | брой | отказали се | мониторинг | останали | Мониторинг сесии |
|-------------|------|-------------|------------|----------|------------------|
| 0-3 месеца | 32 | 7 | 119 | 25 | 725 |
| 3-6 месеца | 24 | 9 | 153 | 15 | 435 |
| 6-9 месеца | 47 | 9 | 189 | 38 | 1102 |
| 9-12 месеца | 12 | | | 12 | 348 |
| общо | 115 | 25 | 461 | 90 | 2610 |

The results of the study can be summarized in three groups:

- ✓ Children born between 38 and 40 years of age without proven medical problems showed a 100% improvement. Change score as an indicator - from no response to response sometimes or yes.
- ✓ Children born before 38 years of age showed a 100% improvement in the Aitem Watching Mother, during feeding. In the remaining components, an improvement was observed, with a decrease in the number of occurrences with a completely negative meaning, at the expense of their transformation into a response "sometimes", which is characterized by an inconclusive performance.

- ✓ Children with proven medical problems showed very good improvement in 3 children. In one child there was no improvement, due to the identification of an intermediate lack of vision and a worsening medical condition.

Following the assessments, it is striking to see a complete shift in the capabilities demonstrated by the children from failure (answer NO) to either complete improvement or to inconclusive performance. The number of convincing performances has improved (YES response). Only one child demonstrated significantly poor communicative abilities by the age of 6 months. In relation to the presented results, the applied experiment can be considered successful in phase 2 - monitoring. It should be concluded that the timely initiation of speech therapy after completion of parental self-assessment questionnaires of learning skills through play leads to improvement in the child's condition, can be used to prevent marked difficulties and leads to improvement in the child's development.

3.4.3. Results of phase 3 - social psychological training

At the final consultation, parents of children aged 0 to 9 months were invited to participate in social psychological training. Only 12 families accepted the invitation. The training was conducted in May 2024. 103 refusals were received, which proves that this form of working with parents is not suitable for implementation when families are regular clients of a speech therapy clinic.

It is also interesting to consider the feedback given after the training and the recommendations made.

The feedback form is filled anonymously, via Zoom platform, Polls functionality. The results are presented in appendix 5 of the thesis.

It is noteworthy that five families did not feel comfortable enough during the training. This is the probable reason why there were 5 responses for not being very satisfied with the practical activities during the training.

12 recommendations were received, nine of which were for the theoretical part to be conducted in the form of webinars for parents. Three recommendations were made for conducting the training online and one recommendation for filming demonstrations for the exercises.

As the Pummelina team has developed a project in collaboration with the team of the Beetles Speech Therapy Clinic and the team of Kangaroo Magazine - "Let's Play Together", containing 28 episodes of video suggestions to improve the play of parents and children. An additional page was created on the digital platform containing all the episodes and additional material to support play between parents and children. The page can be found at <https://pumpelina.bg/da-igraem-zaedno/>.

In relation to the results presented for phase three of the experiment conducted, we can consider this part of the experiment to have failed. The training cannot be accepted as a successful form of training for modern parents to improve the condition of children, to prevent or to stimulate child development, in cases where it is carried out in a group of families who do not know each other previously.

4. Conclusions from the research

Modern parents prefer telepractice as a form of monitoring. I could make a few assumptions - it saves time moving around with the child, it can be conducted at any time of the day regardless of the parent's commitment because it takes between 15 and 30 minutes to monitor. The monitoring is not always done through a video link, which lowers the parents' tension and they do not feel monitored

The tring form of working with parents is not suitable for conducting in a group with casual, unfamiliar parents. This form could be suitable for parents with children up to 6 months who have made a similar request for therapy to be conducted.

Modern parents prefer to listen to information offered about child development in the form of a webinar or other type of telepractice.

The research described from the monitoring and social psychological training for parents in this dissertation proves **hypothesis #2**, namely the **use of the PTESS scale to assess play-based learning skills in children aged 0-4 years provides a reliable and valid tool for measuring cognitive, social, and motor development, contributing to better understanding and support of early childhood development and timely initiation of speech therapy.**

As a result of the above, the following conclusions can be drawn:

1. Parental self-assessment of child development conducted through the PTESS digital platform improves understanding of child developmental delays or delays and parental motivation to initiate speech therapy.
2. Parental self-assessment of child development done through the PTESS digital platform saves parents time in completing the anamnestic data required by speech therapists about their child's development and motivates them to provide it fully to the speech therapist.
3. Different types of play (sensory, motor, social) have a positive impact on the cognitive, social and motor development of children aged 0 to 4 years.
4. Play is an effective means of stimulating language skills and sensory integration in young children.
5. The socioeconomic status of the family influences PTESS scores, with children from lower socioeconomic status showing lower scores.
6. Access to and use of the digital self-assessment platform is limited for families of lower socioeconomic status, which impacts the effectiveness for using the self-assessment scales and timely interventions.
- 7.

5. Contributions from monitoring and socio-pedagogical training for parents

1. A digital platform was developed with questionnaires for parental self-assessment at four ages - 0 to 3 years; 3 to 6 years; 6 to 9 years; 9 to 12 years.
2. Additional questionnaires on feeding skills were developed at two ages - up to 6yrs and over 6yrs.
3. An author's classification of the types of trainings is proposed.
4. An author's classification of types of training for parents is proposed.
5. The author's classification of the forms and systems of training for parents is proposed.
6. An author's concept for social-psychological training for parents is proposed.
7. An original scheme for monitoring through telepractice for children aged 0 to 12 months is proposed to improve feeding and feeding skills.
8. An author's development of a monitoring scheme for parents and children is proposed.
9. An author's elaboration of a program of Social-Psychological Training for improving communication between parents and child is proposed.

Conclusion, generalizations and implications in the overall theoretical-empirical study in the dissertation

Summaries and conclusions

The development of a digital platform with a verified methodology for the study of child development is an outstanding prerequisite for the development of speech therapy theory and practice. The application of therapeutic methods based on parent-conscious decisions saves therapy time and improves its quality. This process begins with awareness of the situation, acceptance of the losses, discovery of the stressor and seeking emotional support through parent self-assessment scales. The theoretical grounding of the problem of providing professional support to parents and professionals, and our experiential research work on the implementation of specific interventions in the context of speech therapy, allow us to draw the following conclusions and generalizations:

1. The research questions developed in the proposed dissertation, as well as the empirical studies described with the methodologies applied in them, prove the research **hypothesis #2 The use of the PTESS scale to assess play-based learning skills in children aged 0-4 years provides a reliable and valid tool for measuring cognitive, social and motor development, contributing to a better understanding and support of early childhood development and timely initiation of speech therapy.**
2. The PTESS scale is a reliable and valid tool for assessing play-based learning skills in children aged 0 to 4 years
3. The digitization of the PTESS scale facilitates the assessment process for professionals through easier access, fast results processing and an intuitive interface.
4. The digitization of the PTESS scale for parents facilitates the process of assessing the child's condition and motivates the parent through the feedback received to initiate speech therapy in a timely manner when necessary
5. Users of the digital platform give positive feedback on the convenience and usefulness of the platform.

The overall conception and design of the digitization of the PTESS Play-Based Learning Skills Assessment Scales are subordinate to the need to facilitate the process of speech therapy diagnosis of early childhood, The studies and data described in Chapters IV, V and VI confirm the validity of the previously formulated **hypothesis #2** in this dissertation, namely: **the use of the PTESS scale to assess play-based learning skills in children aged 0-4 years provides a reliable and valid tool to measure cognitive, social and motor development, contributing to a better understanding and support of early childhood development and timely initiation of speech therapy.**

Contributions and findings from the digitization of the PTESS game-based learning skills assessment scales

1. The empirical data obtained lead to the conclusion that the research **hypothesis #2** previously formulated in the dissertation is confirmed.
2. The results obtained using the PTESS scales prove that digitization can be considered successful.
3. A platform has been developed to support the work of speech therapists in the field of early childhood diagnosis.

4. The developed platform is translated into three languages - Bulgarian, English and Greek, which increases the possibility of its application.

The presented facts and data prove the beneficial effect of the author's educational and therapeutic system PTESS on children's development. The organized environment supports the child's development and provides the child with the freedom to move freely within rules that stimulate their academic skills. Learning through play is the most effective approach in early childhood activities and further stimulation and motivation after the eighth year. Therapeutic intervention follows this model and knowledge of it is an element of successful correction of various maladaptive patterns of behavior, play, and skill acquisition. The digitization of PTESS is a future opportunity to improve therapy in the field of telepractice, as well as to improve parent-child and speech therapist-parent communication.

Using technology in the process of assessing a child's progress is both practical and easy. Its inclusion in the daily work of professionals is inevitable. In order to use digital forms to collect information, these forms must meet certain requirements: they must be easy to complete, concise and the questions must be worded in an understandable way. In this case, the use of verified digital scales to assess child development is convenient for parents, which is particularly important given the fact that parents' levels of general knowledge vary. Data should be able to be processed quickly and easily in order to be able to compare information collected from different respondents in a timely manner.

Conclusions

On the basis of the research conducted related to the verification and digitization of the PTESS Play-Based Learning Skills Assessment Scale in the age range of 0 to 4 years, the following detailed conclusions can be drawn:

1. Confirmation of the validity and reliability of PTESS
 - The findings of this study indicate that the PTESS scale is a reliable and valid tool for assessing the cognitive, social and motor development of children aged 0 to 4 years. The validation of the PTESS by comparison with the Munich Functional Diagnosis of Development (MFED) proved that the two methodologies provide similar results, supporting the scientific validity of the PTESS.
2. The game as the main means of development
 - The research highlights that play is a leading vehicle for early child development. Through play, children develop not only their cognitive and motor skills, but also their social abilities to interact with others. Play activities stimulate sensory integration, communication skills and language development, as well as motor planning and coordination.
3. Early detection of problems through PTESS improves interventions
 - One of the main findings is that early detection of potential developmental difficulties using PTESS allows for timely initiation of speech therapy and other types of interventions. The study shows that when parents are engaged in the assessment process through self-assessment, they are more likely to seek professional help at an earlier stage, leading to better outcomes in the therapeutic process.

4. The benefits of PTESS digitalization
 - Digitization of the PTESS scale facilitates the assessment process for both professionals and parents. The online self-assessment platform provides easier access to the information and significantly shortens the data processing time. In addition, the digital version makes the instrument more accessible for use in a wide range of social and cultural contexts, which is particularly important for achieving greater coverage of target groups.

5. Positive results of the social psychological training for parents
 - The results of the experiment, which included monitoring and social-psychological training for parents, showed a significant improvement in parents' communication and social skills. This improvement contributes to their better preparation for their role as educators and partners in child development. The training provides not only theoretical knowledge, but also practical skills to cope with the daily challenges of raising children.

6. The importance of parental involvement in the assessment process
 - One of the most significant findings is that engaging parents in the assessment process through the digital self-assessment platform significantly improves the outcomes of therapeutic interventions. Parents who are active participants in the assessment of their children's skills have a better understanding of their child's needs and are more motivated to follow through with professionals' recommendations.

7. Socio-economic factors influence access to diagnosis and therapy
 - The study reveals that socioeconomic factors can influence access to diagnosis and therapy. Children from lower social status families often have less access to early diagnostic tools such as PTESS. This raises the issue of the need to develop programs that provide equal access to assessment and therapeutic support regardless of social status.

8. Play is a key factor for sensory integration and cognitive development
 - By analysing the different types of games used in PTESS, the study highlights their importance for the development of sensory integration, cognitive skills and social competence. The development of these skills is the foundation of a child's future academic and social functioning.

9. Need for continuous improvement and expansion of PTESS
 - The findings of the study show that PTESS is a dynamic tool that can be adapted and extended according to users' needs. Continuous refinement of the scale and digital platform is needed, taking into account new research and technological innovations, to ensure maximum accuracy and applicability of the results.

10. Educational programmes for parents
 - The study highlights the need to develop educational programs for parents to inform them about the importance of early detection of developmental problems and how to use PTESS as a self-assessment tool. Increased awareness and education of parents will contribute to their more effective participation in the process of raising and educating their children.

Recommendations

After the research and analysis carried out within the dissertation "Verification and Digitization of a Scale for the Assessment of Play-Based Learning Skills PTESS at the Age of 0 to 4 Years", the following recommendations can be formulated:

1. Wider application and implementation of PTESS in practice

1.1. Implementation in childcare and early childhood development centres:

- It is recommended that PTESS be implemented in nurseries, kindergartens and early childhood development centres as a standard tool for child development assessment. This will allow educators and early childhood development specialists to monitor and support children's development more effectively by identifying intervention needs in a timely manner.

1.2. Integration into the health care system:

- It is recommended that PTESS should also be integrated into the practice of paediatricians and child health specialists as part of routine check-ups of children. This would allow early detection of developmental problems and timely referral for appropriate therapy or further diagnosis.

2. Further studies and adaptations

2.1. Conduct research in different socio-economic settings:

- Further research is recommended to examine the effectiveness of PTESS in different socio-economic contexts and cultural settings. Such research will contribute to the adaptation of the scale and ensure its validity in a wide range of social settings.

2.2. Adaptation for children with special educational needs (SEN):

- Adaptation of PTESS for working with children with special educational needs is recommended. This could include modifications to the criteria and categories to reflect the specific needs and abilities of these children, ensuring they have equal access to assessment and therapy.

3. Expansion of the PTESS digital platform

3.1. Mobile application development:

- It is recommended to develop a mobile application on the PTESS digital platform to further facilitate access to the scale and make the self-assessment process more convenient for parents. The mobile app could include reminders, tips and recommendations based on the data entered, which would improve parental engagement.

3.2. Introduction of personalised recommendation functions:

- It is recommended that the platform be upgraded with features that provide personalized recommendations based on the assessment results. These recommendations could include guidance on play, communication, motor skill development and other activities to support the child's specific needs.

3.3. Improving the interface for professionals:

- It is important to consider improving the administrative dashboard for professionals by adding tools for data analysis, report generation and the ability to compare results over time. This will support a more in-depth analysis of children's development and provide a better basis for decision making on necessary interventions.

4. Awareness raising and training

4.1. Conducting trainings for professionals and parents:

- It is recommended to organize trainings and workshops for professionals working with children and for parents to inform them about the possibilities and benefits of using PTESS. Trainings could include practical sessions on using the digital platform as well as strategies to support children's development through play.

4.2 Publication of information materials:

- It is recommended that information materials be developed and disseminated to explain the benefits of early diagnosis and monitoring of child development. These materials could be targeted at parents, educators and health professionals, emphasising the importance of regular assessment and early intervention.

5. Sustainability and future development

5.1. Ensure long-term maintenance of the digital platform:

- It is recommended that long-term maintenance and updating of the PTESS digital platform be ensured, including opportunities to add new functionalities and adapt to changing user needs.

Conclusion

To conclude this dissertation on the verification and digitization of the PTESS play-based learning skills assessment scale, it is necessary to highlight the importance of innovation in the field of early childhood diagnosis and the role of technology in improving assessment and intervention processes. The main aim of the study is to validate PTESS as a reliable tool that uses play, a proven method to monitor and stimulate children's cognitive, social and motor development. This study found that using play to assess skills allows for more accurate results because it offers a natural context for analyzing children's behavior and development.

The validation of the PTESS scale is a key aspect of the present work and involves comparison with established methodologies such as the Munich Functional Diagnosis of Development (MFED). This comparison demonstrates a high degree of concordance and proves that the PTESS is not only suitable for use by professionals, but also for facilitated use by parents through digitized tools. This innovation facilitates parents' access to early diagnostic opportunities by actively engaging them in the process and improving their awareness of their child's needs.

Developing a digital platform to implement PTESS provides a number of benefits, including faster processing of results and providing specific recommendations for future steps. The platform enables monitoring of changes in a child's skills and tracking their progress over time, which is valuable for both parents and professionals involved in the learning and therapy process. This form of self-assessment encourages parents to be actively involved in their child's development, to recognise problems at an early stage and to seek adequate support when needed.

One of the significant contributions of this dissertation is the development of a practical methodology for integrating PTESS into the digital world. This approach not only facilitates the work of professionals but also enhances the quality of services provided to families. Through the digital platform, parents receive timely and structured information about their children's development, thus reducing the risk of missing important aspects of child development. The platform also provides the opportunity for flexible adaptation of therapeutic and educational programmes according to the individual needs of the child.

The research highlights that play is not just a form of entertainment, but a powerful learning and assessment tool that enables the monitoring of diverse aspects of development. The application of the PTESS provides a workable tool for examining the long-term effects of play on children's social, communication, and motor skills. Verification results indicate that this tool can be widely applied in a variety of cultural and social contexts, thus expanding its scope and relevance.

The digitisation of PTESS also creates the prerequisites for the creation of a database that can be used for further research and analysis. This facilitates access to aggregated data that can support researchers and practitioners in their search for new approaches to early childhood development and therapy.

In summary, this paper demonstrates that the digitization of the PTESS scale not only supports the work of professionals, but also facilitates parental involvement, creating a more accessible and effective environment for early assessment and intervention. The PTESS scale and its digital version prove that innovation in the field of child development is not only possible but necessary to improve the quality of life and developmental prospects of children.

Contributions of the PhD student

1. Theoretical contributions

- **Developed a model for play as a learning tool:**
An innovative theoretical model is proposed that considers play as a fundamental tool for the development of cognitive, social and motor skills in children aged 0-4 years. The model is the basis for the PTESS scale (Pumpelina Therapy and Education System Scales) applicable in Bulgarian speech therapy practice.
- **Identified factors influencing development:**
Through factor analysis, key factors such as sensory integration, motor planning, and social skills were identified as playing a critical role in a child's successful learning and socialization.
- **Comparison with international methodologies:**
A comparative analysis between the PTESS and the internationally recognized Munich Functional Diagnosis of Development (MFED) was developed, with results confirming similarity and scientific validity.

2. Practical contributions

- **Verification of PTESS:**
An empirical study involving 450 children was conducted, demonstrating the validity and reliability of the PTESS as a child development assessment tool.
- **Digitalization of PTESS:**
An online platform has been developed that allows easy access to the scale for both professionals and parents. A parent self-assessment option is included, increasing the accessibility and practical application of the tool.
- **Social-psychological training for parents:**
Specialized training has been created to assist parents in developing communication and social skills aimed at stimulating child development.
- **Empirical analysis of results:**
Data from the study show significant effectiveness of PTESS in early diagnosis, providing evidence for the need for early intervention and developmental monitoring of children.
- **Applicability in different socio-economic contexts:**
The work examines the validity of PTESS in a wide range of social and cultural settings, allowing for future application in other countries.

3. Integration with speech therapy practice

- **Practical application of PTESS:**
The tool has been implemented in speech therapy to detect potential problems early and to create individualized treatment plans.
- **Facilitated diagnostics and monitoring:**
The PTESS digital platform provides intuitive analysis and monitoring tools that are easily accessible to both professionals and parents. This speeds up the diagnostic process and ensures timely therapeutic intervention.
- **Improving the quality of speech therapy care:**
PTESS offers an innovative approach that combines evidence-based diagnostics with practical solutions that improve the quality of care for children at risk of developmental delay.