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EXAMINATION OF HUMAN-ANIMAL INTERACTIONS: CHANGES IN HUMAN AND ANIMAL STRESS LEVELS DURING ANIMAL-ASSISTED ACTIVITIES

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1. Background and Objectives of the Research

1.1. Research Background

The relationship between humans and animals spans millennia, rooted in a time when humans were intrinsically linked to and dependent on nature. Animals provided essential support for survival, aiding in hunting, labor, and transportation. Urbanization and the Industrial Revolution significantly impacted and transformed this relationship. Human reliance on animals diminished, yet their social role became increasingly prominent, fulfilling a void created by the absence of human companionship. Research exploring the human-animal bond indicates that beyond emotional effects, animals often exert therapeutic benefits, positively influencing human health, mental, and psychological well-being. Recognizing this, attention has been directed towards the stress- and anxiety-reducing effects of animals in both natural and controlled environments (healthcare, social care, public education, and correctional institutions).

Of particular relevance to this research is the relationship between children (especially those with various anxiety disorders and behavioral problems) and animals. While numerous studies in recent years have examined various parameters (such as respiration rate, heart rate, blood pressure, and cortisol levels) in both humans and animals involved in human-animal interactions, investigations that simultaneously examine both parties within the same interaction framework remain scarce. Therefore, this research aims to address this gap in the existing literature.

It is crucial that observations and investigations during human-animal interactions consider not only the benefits for the human side but also animal welfare and the biological needs of the interacting animals. Given the mutual influence inherent in these interactions, it is essential to consider the animal's needs and be knowledgeable about its husbandry and care. Children must be educated on how to initiate and conduct interactions in a manner that is both optimal and safe for the animal. To ensure the animal's well-being and rest, alternating between active and passive tasks is important, as is maintaining the animal's motivation throughout the interactions. If the animal involved in animal-assisted interventions is appropriately selected, prepared, trained, and handled with care, it can be expected to interact safely and cooperatively, exerting numerous positive effects on the human participant. This research investigates this unique interaction.

1.2. Research Objectives: Investigating the Effects of Animal-Assisted Activities on Stress

Previous research on animal-assisted activities has almost exclusively focused on one participant (either the animal or the human), seeking to understand the effects of human-animal interaction on the individual involved. This dissertation presents research that deviates from this approach by examining humans and animals simultaneously, primarily focusing on the impact of animal-assisted activities on anxiety and stress. The research involved rabbits and horses, and on the human side, primary school children, including both typically developing and children with disabilities. The objectives of the research forming the basis of this dissertation are tailored to the subjects of each study. Consequently, three distinct research objectives were formulated:

1. To measure changes in the trust/familiarity level of rabbits involved in animal-assisted activities during interactions with young children.
2. To measure changes in the stress levels of school horses and therapy horses in response to interactions with typically developing and disabled primary school-aged riders.
3. To measure changes in stress and anxiety levels in typically developing and disabled primary school-aged children following equine-assisted activities/therapy and rabbit-assisted sessions.

1.3. Formulation of Research Questions

The research questions and hypotheses investigated within this dissertation are as follows:

1. Research Question: How does interaction with children affect animals involved in animal-assisted activities?

The following hypotheses were investigated regarding the first research question:

H.1: It is hypothesized that the stress levels of the animals involved in the study will increase as a result of animal-assisted activities with children.

H.2: It is hypothesized that animal-assisted activities will result in measurable changes in the animals' stress levels, as evidenced by the Trust/Familiarity Test, behavioral analysis, ocular thermography (eye temperature measurement), and eye blink rate measurement.

2. Research Question: How does interaction with animals affect children involved in animal-assisted activities?

The following hypotheses were investigated regarding the second research question:

H.1: It is hypothesized that the stress levels of the children involved in the study will decrease as a result of animal-assisted activities with animals.

H.2: It is hypothesized that animal-assisted activities will result in measurable changes in stress levels, as evidenced by the STAI-C test (State-Trait Anxiety Inventory for Children) and pulseoximetry measurements.

2. Materials and Methods

Methodology of Animal-Assisted Research

This dissertation is based on several studies. While the studies involving rabbits, though building upon each other, were conducted independently with different research objectives, the studies involving horses, despite taking place at different times and locations, were carried out with identical research objectives and methods. **Figure 1.** summarizes the main objectives of the studies presented in this dissertation, as well as the subjects of the measurements. In subsequent chapters of the dissertation, the objectives, detailed methodology, data collection methods, and results of each study presented in **Figure 1.** will be described separately. A common thread across all the studies conducted is the simultaneous examination of all participants involved in the human-animal interaction. Thus, each study operates on the premise that the activity jointly performed by the therapist, the child, and the specially trained animal has an impact on all participants in the interaction.

Parents of the children participating in the animal-assisted programs were informed in writing about the studies, and written consent was obtained from them. Prior to the studies, information was gathered regarding any potential contraindications affecting the children, such as animal hair allergies, asthma, or severe, insurmountable fear of animals. None of the mentioned contraindications were present in any of the participating children, so no child had to be excluded from the research.

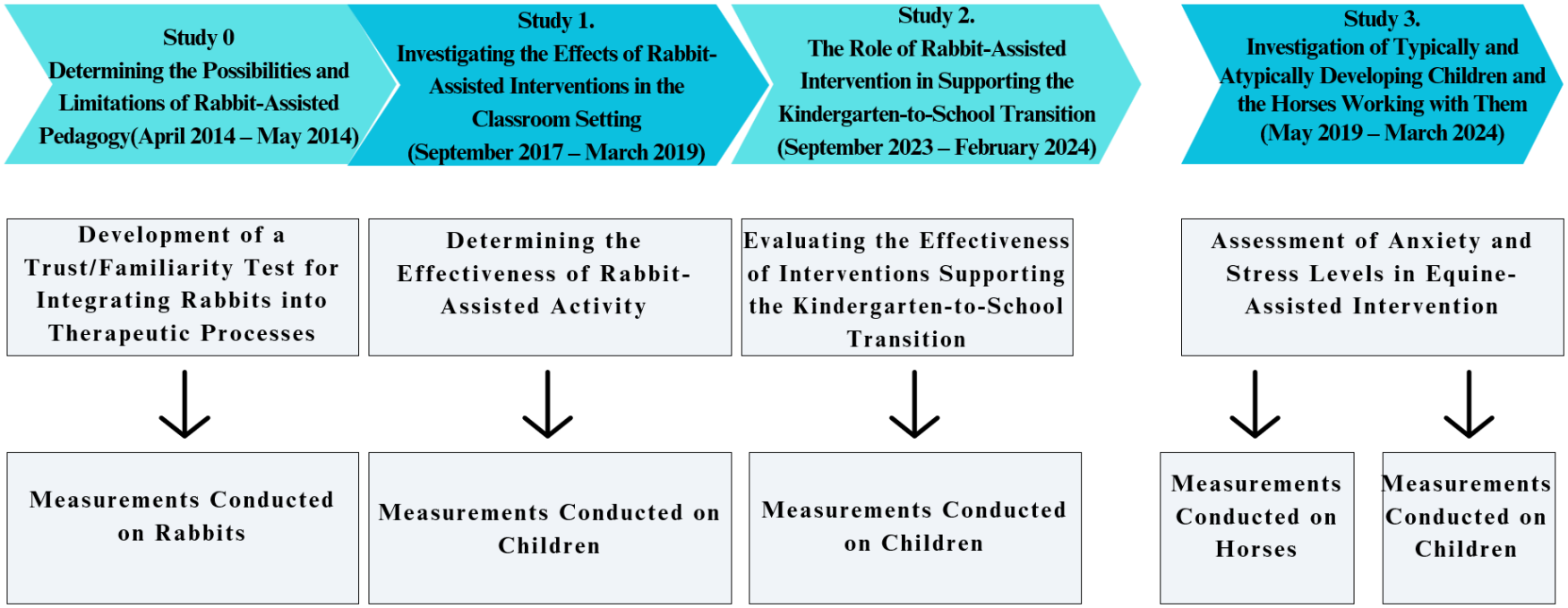

Figure 1. Main Objectives of the Studies Described in this Dissertation

The development of measurement tools for the rabbit-assisted research began within Study 0 in April-May 2014. This study aimed to determine the possibilities and limitations of rabbit-assisted pedagogy. The objective of this study was to develop a Trust/Familiarity Test that could be safely used for the integration of rabbits into therapeutic processes. The research involved measurements on rabbits and the creation and testing of the Trust/Familiarity Test. The measurements were conducted in a kindergarten in Törökbálint (in cooperation with the professional team), involving 8 rabbits. The program lasted six weeks, and the rabbits were tested every two weeks with the Trust/Familiarity Test.

Study 1. lasted from September 2017 to March 2019, during which the effects of rabbit-assisted interventions in a classroom setting were investigated. The research aimed to measure the effectiveness of rabbit-assisted activity, involving a total of 51 students. The study involved measurements on children. First-grade students from two primary schools and four handled therapy rabbits participated in the research. Twenty-nine students from a mainstream school and 22 students from an integrated institution participated in the study. During the research period, six-week periods with and without animal assistance alternated, and the children were tested every three weeks using the STAI-C test.

Study 2. lasted from September 2022 to February 2023. This research explored the role of animal-assisted intervention during the transition from kindergarten to school. The study aimed to determine whether animal-assisted intervention could effectively support the kindergarten-school transition. This study also involved measurements on children in a primary school in Kaposvár, with 16 first-grade students and one handled therapy rabbit participating. During the research period, six-week periods with and without animal assistance alternated, and the children were tested every three weeks using the STAI-C test.

Study 3. lasted from May 2019 to March 2023. This research involved the observation and testing of typically and atypically developing children (riders) and the horses working with them. The study aimed to observe anxiety and stress levels during equine-assisted intervention. The research involved measurements on both children (riders) and horses. The program included 10 therapy horses, 8 school horses, and 18 children (both typically and atypically developing). For the horses, a Trust/Familiarity Test (or appropriate alternative), eye temperature measurement, and eye blink rate measurement were performed before and after the sessions, while behavioral analysis was recorded during the sessions. For the children (riders), pulse oximetry measurements were performed before and after the animal-assisted sessions.

3. Results

3.1. Summary of Studies Involving Rabbits

In recent years, increased attention has been paid to transitions between levels of education, particularly the critical transition from kindergarten to school in early childhood. The transition from kindergarten to school is an anxiety-provoking period in a young child's life, which educators attempt to mitigate in numerous ways. The range of interventions and best practices supporting the kindergarten-school transition is expanding daily, reflecting the needs expressed by parents and educators. Animal-assisted intervention in the kindergarten-school transition aims to provide educators with a tool that can contribute to reducing the tension and alleviating children's anxiety during this period.

My studies involving rabbit(s) sought to answer the following questions: (1) Can the rabbits involved in rabbit-assisted sessions be measured and tested using a Trust/Familiarity Test? (2) How do children's stress levels (state and trait anxiety levels) change as a result of rabbit-assisted sessions? (3) Do rabbit-assisted sessions support the kindergarten-school transition and contribute to changes in children's stress levels?

A control group experimental design was rejected, as it was believed that the experimental effect could be influenced by numerous factors that are difficult to measure with objective tools. I believe the research design I employed allowed me to demonstrate the effect of animal-assisted intervention, isolating it from the effects of other pedagogical interventions, as the only difference between the periods with and without rabbit presence was the animal's presence in the classroom. The observed variables were the rabbits' trust/familiarity level and the children's state and trait anxiety levels.

Regarding the Trust/Familiarity Test, it can be stated that the trust/familiarity index of the eight rabbits involved in the research changed significantly during the research period, in a positive direction. All of them showed an increasing trend in their trust/familiarity index based on the data measured at the end of the research. The rabbits' trust/familiarity was measured with three individuals. At the beginning of the research, they were most trusting/familiar with the teacher, i.e., the owner, and this trust/familiarity did not change at the end of the research. They were least trusting/familiar with the children both at the beginning and end of the research. However, the level of trust/familiarity increased with all three contact persons from the beginning to the

end of the study. I also examined the rabbits' trust/familiarity in their living and transport cages; the results indicate that all eight rabbits had higher trust/familiarity scores in their living cages than in their transport cages. These values also show an increasing trend from the beginning to the end of the study.

Regarding children's anxiety levels, it can be stated that, as a result of the rabbit-assisted intervention, children's anxiety levels showed a decreasing trend in both School 1 and School 2 during the research. Students in School 2 showed significantly lower anxiety scores than students in School 1; however, it can be uniformly stated that anxiety levels were lower in both institutions during the rabbit-assisted periods than in the periods without the rabbit. In terms of gender comparison, it can be stated that boys' anxiety was lower than girls'.

During the kindergarten-school transition study, as a result of the rabbit-assisted intervention, a decreasing trend was observed in both state and trait anxiety levels in the students involved in the study during the rabbit-assisted periods, while an increasing trend was observed during the rabbit-free periods. Both state and trait anxiety were significantly higher during the periods when the therapy rabbit was not present in the classroom.

During the three-week period between weeks 6 and 9 of the study, the state anxiety of the children involved in the study decreased significantly. In the period between weeks 12 and 18, when there was no therapy rabbit in the classroom, the children's anxiety levels showed a slight increase. No difference was found in the change in anxiety between boys and girls; therefore, rabbit-assisted intervention reduces anxiety to a similar extent in both boys and girls. However, in the case of trait anxiety, a more pronounced decrease in anxiety was observed in girls. In children with high levels of trait anxiety, the rabbit-assisted intervention demonstrated a greater anxiety-reducing effect.

3.2. Summary of Studies Involving Horses

Working with typically and atypically developing children can often be demanding for horses. My research sought to answer the question of how the stress levels of horses (school horses and therapy horses) and children change during different equine activities (riding and equine therapy). The observed variables were the horses' trust/familiarity level, eye temperature, eye blink rate, and behavioral analysis, while for the children, the change in pulse rate was observed.

Regarding the Trust/Familiarity Test, the school horses performed less well on both the pre- and post-intervention tests than the therapy horses, regardless of the person administering the test. From this observation, we can conclude that therapy horses are more open to interaction with humans, and/or that the testers themselves were more comfortable with the therapy horses both before and after the intervention.

In terms of eye temperature observation, it can be stated that the eye temperature of the left eye of both therapy and school horses was higher than the temperature of the right eye before the intervention. Furthermore, a decrease in eye temperature was observed in both eyes of the therapy horses at the end of the sessions, while an increase was observed in the school horses. From this observation, we can infer that no increase in stress levels occurred in the therapy horses, while it can be assumed that it did occur in the school horses.

Regarding eye blink rate, it can be stated that the blink rate of the therapy horses was higher before the sessions than that of the school horses. However, a decrease in blink rate was observed in the therapy horses at the end of the sessions, while an increase was observed in the school horses. From this observation, we can conclude that no increase in stress levels occurred in the therapy horses, while it can be assumed that it did occur in the school horses.

From the behavioral analysis, based on the observations and recorded data, it can be stated that school horses exhibited significantly more stress-related behaviors (such as halting, bolting/running away, rearing, bucking) than therapy horses. From this observation, we can infer that therapy horses, due to their specialized training, tolerate working with children better than school horses. Based on the behavioral analysis, the work with children is less demanding for therapy horses than for school horses.

Regarding the children's pulse rate measurements, it can be stated that a decreasing trend in pulse rate values was observed in all children as a result of the equine therapy sessions, despite the fact that riding, even to a small extent, is considered a physical exertion. The decreasing trend observed in the pulse measurements suggests that the children's stress levels did not increase but rather decreased as a result of the equine therapy sessions.

Based on the observed variables, it can be stated that therapy horses are more open to human interaction, are more willing to interact with people, and tolerate working with children better.

Regarding the riders, it can be stated that equine therapy sessions help reduce children's stress levels.

3.3. Feedback on the Dissertation's Research Questions and Hypotheses

Research Question: How does interaction with children affect animals involved in animal-assisted activities?

- **H.1:** It is hypothesized that the stress levels of the animals involved in the study will increase as a result of animal-assisted activity with children.
    - **Partially confirmed:** No increase was observed in trained individuals, while an increase was observed in untrained individuals.
- **H.2:** It is hypothesized that animal-assisted activity will result in measurable changes in the animals' stress levels, as evidenced by the Trust/Familiarity Test, behavioral analysis, eye temperature measurement, and eye blink rate measurement.
    - **Confirmed.**

Research Question: How does interaction with animals affect children involved in animal-assisted activities?

- **H.1:** It is hypothesized that the stress levels of the children involved in the study will decrease as a result of animal-assisted activity with animals.
    - **Confirmed.**
- **H.2:** It is hypothesized that animal-assisted activity will result in measurable changes in stress levels, as evidenced by the STAI-C test and pulse oximetry measurements.
    - **Confirmed.**

3.4. Summary of Animal-Assisted Studies

This dissertation examined the effect of rabbit-assisted intervention (RAI) and equine-assisted intervention (EAI) on anxiety levels in children. The results indicate that RAI can be successfully applied to reduce anxiety in first grade in both mainstream and integrated educational institutions. Its effect depends on the initial level of anxiety; a greater effect was demonstrated in cases of higher initial anxiety. The Trust/Familiarity Test developed for rabbits aids in evaluating and understanding the suitability of the rabbits involved in the intervention. The test provides insight into the relationship between the rabbits and the person testing them.

The test also revealed that rabbits can differentiate between individual handlers. They are most trusting with the caregiver and least trusting with the children; however, this can be improved through positive human interaction.

As a result of EAI, a decreasing trend was observed in the pulse values of the children participating in the sessions, suggesting a reduction in stress levels. The Trust/Familiarity Test developed for horses aids in testing and understanding the horses involved in the intervention. The test provides information about the relationship between humans and horses and demonstrates the extent of the horses' willingness to connect with people.

Significant individual differences were detected in the animals involved in the interventions (both rabbits and horses); however, my results suggest that appropriate selection, training, and handling of the animals can contribute to stress reduction.

Because these animals interact with people, and most often with children, it is crucial that we can observe and measure the animals' stress reactions. Stress levels are most often measured by researchers using invasive methods, such as measuring cortisol levels from blood; however, in these cases, it cannot be precisely determined whether the animal's stress reaction is due to the intervention or whether it had a high stress level before the measurement. The use of the Trust/Familiarity Test, eye temperature and eye blink rate measurement, and behavioral analysis provides an opportunity for non-invasive measurement. With these tests and examination methods, we can easily, quickly, and painlessly gain insight into the relationship, trust/familiarity, and stress levels of the animal involved in the animal-assisted intervention.

4. Conclusions and Recommendations

For children participating in animal-assisted intervention, both rabbit-assisted and equine-assisted sessions have stress- and anxiety-reducing effects. The effect of the intervention depends on the initial stress level; a greater anxiety-reducing effect is demonstrated in children with high initial anxiety. The Trust/Familiarity Tests I developed for both rabbits and horses are suitable for selecting individual animals for therapy, determining individual differences, defining their relationship and trust with different individuals, and demonstrating the extent of their willingness to connect with people.

Measuring the stress levels of animals involved in animal-assisted intervention is of paramount importance from a safety, animal welfare, and animal protection perspective. The use of the

Trust/Familiarity Test, eye temperature and eye blink rate measurement, and behavioral analysis provides a non-invasive measurement opportunity.

Due to the small sample size and large individual differences among the research subjects (animals and children involved in the research), I was not always able to demonstrate a statistically significant effect of the animal-assisted intervention; however, the trends were clearly observable. A further limitation of my research is that, although the same environment and the same people were present during the research period, other factors not examined by me may have influenced the stress/anxiety levels of the animals and children.

According to my measurements and experiences, animal-assisted sessions are suitable for supplementing pedagogical work to reduce children's school-related anxiety, especially in the case of students exhibiting "high levels of anxiety," thereby improving the effectiveness of teaching and educational work and supporting the kindergarten-school transition. Animal-assisted activities support first-grade children's start to school and coping with the anxiety and stress caused by the increased demands compared to kindergarten.

The results of my study offer new opportunities for educational institutions to reduce anxiety and stress during the kindergarten-school transition. Animal-assisted intervention initiated in kindergarten using AAI methods and then continued among children starting their school studies represents a familiar environment and methodology, thereby significantly increasing its effectiveness and supporting the kindergarten-school transition.

I believe that animal-assisted intervention can also be applied during transitions occurring in later life stages, such as the transition from primary school to secondary school or in the case of children entering adolescence, as the changes occurring during this period and the identity crisis can generate significant anxiety among them. The investigation of these areas awaits further research.

With interested and open-minded educators willing to integrate animal-assisted intervention into pedagogical processes, and with specially trained animals, the method can be well integrated into the daily routine of educational institutions.

5. New Scientific Results

The studies presented in this dissertation yielded several novel findings, which are as follows:

1. I developed Trust/Familiarity Tests for examining the relationship between rabbits and humans and between horses and humans, and conducted practical trials of these tests.
2. I demonstrated that rabbits' trust/familiarity can be increased through positive (conscious) human interaction.
3. I showed that rabbits differentiate between individual handlers (caregiver, unfamiliar adult, child), with their trust/familiarity being highest with the caregiver and lowest with children.
4. I demonstrated that rabbits' trust/familiarity is greater in their living cage than in their transport cage.
5. I demonstrated that rabbit-assisted intervention (RAI) can be successfully applied to reduce anxiety levels in first grade in both mainstream and integrated educational institutions. This is particularly true in the integrated institution, where a greater effect can be achieved through RAI.
6. I showed that in some cases, among children belonging to the normal anxiety category, the presence of the rabbit can even disrupt students' learning performance.
7. I showed that RAI has a significant anxiety-reducing effect in children exhibiting high levels of trait anxiety.
8. I demonstrated that school horses performed less well on both the pre- and post-intervention Trust/Familiarity Tests than therapy horses, regardless of who administered the test.
9. I demonstrated that eye temperature and eye blink rate measurement, along with behavioral analysis, provide a non-invasive method for measuring stress levels in horses.

6. Publication on the topic of dissertation

Scientific journal articles

1. **Iváncsik, Réka** ; Podráczky, Judit ; Molnár, Marcell ; Stromájer, Gábor Pál ; Csima, Melinda

The Role of Animal-Assisted Intervention in Supporting the Preschool-to-School Transition

INTERNATIONAL JOURNAL OF EARLY CHILDHOOD (2025) 2025. 1-20 pp

2. Gábor Pál, Stromájer ; Melinda, Csima ; **Réka, Iváncsik** ; Bernadett, Varga ; Krisztina, Takács ; Tímea, Stromájer-Rácz

Stress and Anxiety among High School Adolescents: Correlations between Physiological and Psychological Indicators in a Longitudinal Follow-Up Study CHILDREN (BASEL) 10 : 9 Paper: 1548 , 16 p. (2023)

3. Molnár, Marcell ; Suba-Bokodi, Éva ; **Iváncsik, Réka**

A nyulak felhasználhatósága az állatasszisztált pedagógiai fejlesztő munkában ÁLLATTENYÉSZTÉS ÉS TAKARMÁNYOZÁS 71 : 3 pp. 170-184. , 15 p. (2022)

4. **Iváncsik, Réka** ; Molnár, Marcell

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Book chapter

1. Molnár, Marcell ; **Iváncsik, Réka** ; Di Blasio, Barbara

Első osztályos tanulók iskolakezdési stresszének csökkentése állattal asszisztált foglalkozások keretében In: Ács-Bíró, Adrienn; Maisch, Patrícia; Molnár-Kovács, Zsófia (szerk.) Iskola a társadalmi térben és időben IX Pécs, Magyarország : PTE BTK "Oktatás és Társadalom" Neveléstudományi Doktori Iskola (2021) 273 p. pp. 146-156. , 11 p.

2. Marcell, Molnár ; **Réka, Iváncsik** ; Barbara, Di Blasio

ON THE POSITIVE EFFECT OF RABBIT-ASSISTED INTERVENTIONS IN CLASSROOM ENVIRONMENT ON THE ANXIETY OF PUPILS In: Carmo, Mafalda

(szerk.) Education Applications & Developments IV: Advances in Education and Educational Trends Series Lisboa, Portugália : InScience Press (2019) pp. 215-225. , 11 p.

3. Gyöngyösi, Anita ; **Iváncsik, Réka**

Az állatasszisztált pedagógia lehetőségei óvodáskorú gyermekeknél In: Takács, István (szerk.) Kaposvári Gyógypedagógiai Vademecum III : Állatasszisztált kutatások Kaposvár, Magyarország : Kaposvári Egyetem Pedagógiai Kar (2015) 124 p. pp. 17-32. , 16 p.

Conference in journal or conference paper

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Abstract

1. **Iváncsik, Réka** ; Molnárné, Bajzik Melinda ; Suba-Bokodi, Éva ; Molnár, Marcell

A törpenyulakkal végzett fejlesztés hatása az elsőosztályos gyerekek évkezdési szorongására In: Lovas Kiss, Antal (szerk.) Az ember-állat kapcsolat perspektívái : Antrozoológiai Konferencia : absztraktkötet Debrecen, Magyarország : Debreceni Egyetem (2022) pp. 16-16. , 1 p.

2. Molnár, Marcell ; **Iváncsik**, **Réka** ; Suba-Bokodi, Éva

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3. Suba-Bokodi, Éva ; **Iváncsik, Réka** ; Molnár, Marcell

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7. Kardos, Edina ; Somosközi, Csilla ; **Iváncsik, Réka** ; Cseri, Enikô ; Leipold, Annamária ; Ferentz, Anna Kata ; Franciskovics, Eszter ; Meiszterics, Dorka ; Hörcsik, Edit

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