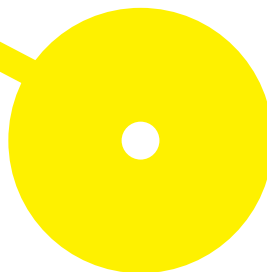




The Intervention of Occupational Therapist using Hippotherapy as an Occupational Therapy Treatment Tool for Transdiagnostic Individuals: a Scoping Review

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Dissertação para cumprimento dos requisitos necessários à
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Abstract

Background: An OT sees each person as an occupational being which helps the therapist focus his reasoning perspective on what, how, when, and why of an individual's need for activity. HPOT as an OT treatment tool provides ample opportunities for treatment interventions with a high level of motor and sensory quality and a rich environment for developing skills in a meaningful context, in various diagnoses.

Aims: To analyze, synthesize, and map the current state of existing knowledge on interventions performed and proposed by OT using HPOT as a treatment tool for transdiagnostic individuals.

Material and Methods: Scoping Review prepared according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) and based on the Joanna Briggs Institute (JBI) protocol. A thematic categorical analysis of the articles was performed using webQDA software.

Results: Of the 290 studies initially identified, 23 articles were selected according to the inclusion criteria, showing the contribution of hippotherapy as an OT treatment tool and the identification of gaps.

Conclusion and significance: The results demonstrate that OT sessions using HPOT as an OT treatment tool follow assessments with standardized and non-standardized instruments. OTs prefer the therapeutic use of occupations and activities, educational processes, and group sessions, using activities both on the ground and on horseback. These findings reinforce the value of HPOT as an OT treatment tool, promoting improvements in occupational performance, participation, and quality of life for transdiagnostic individuals.

Keywords: Occupational therapy; Hippotherapy; Transdiagnostic Individuals

Introduction

The American Occupational Therapy Association (AOTA) defends that the relationship between people and their animals is so important that taking care of a pet is considered an Instrumental Activity of Daily Living (Ajzenman et al., 2013; American Occupational Therapy Association, 2020). It is also known that developing relationships with animals provides physical and psychological benefits and gives the individual the opportunity to experience positive interactions that can be generalized to other contexts (AOTA, 2020; Cotton, 2021).

According to the American Hippotherapy Association (AHA), it is essential that terminology, as outlined, is used to promote clarity, consistency, and transparency, resulting in improved quality of communication, better consumer protection and expanded professionalism (AHA, 2021; Wood et al., 2021). Recently, authors developed an investigation about the optimal terminology for services in the United States that incorporate horses to benefit people (AHA, 2021; Wood et al., 2021). The consensus-building process culminated in the identification of twelve specific services of Equine-Assisted Services (EAS) that relate to three broad areas of professional work: Therapy, Learning, and Horsemanship (AHA, 2021; Wood et al., 2021). Related to the broad area of Therapy, professionals can integrate horses into five distinct therapies: Counseling, Occupational Therapy (OT), Physical Therapy (PT), Psychotherapy (PST), and Speech-Language Pathology (SLP) (AHA, 2021; Stern & Chur-hansen, 2019; Wood et al., 2021).

In fact, the use of therapy-first language is recommended regardless of profession. Therapy-first language clarifies the kind of therapy provided and describes the service appropriately in a healthcare setting (examples include OT using equine movement or OT incorporating equine interaction) (AHA, 2021; Guindos-Sanchez et al., 2020; Stern et al., 2019). So, therapy-first language refers to how licensed therapy professionals may incorporate hippotherapy (HPOT) as one tool in therapy plan, a therapist never stops doing OT, PT and SLP and starts doing only HPOT (AHA, 2021; Guindos-Sanchez et al., 2020; Stern et al., 2019). According AHA, terminology for healthcare also suggests the use of the term HPOT which refers to how OT, PT and SLP professionals use evidence-based practice and clinical reasoning in the purposeful manipulation of equine movement to engage sensory, neuromotor and cognitive systems to achieve functional outcomes (AHA, 2021; Stern et al., 2019). HPOT is best described as a treatment tool, an object or element that can be manipulated to achieve specific goals (horse movement or the interaction can be a tool when skillfully provided by a therapist) (AHA, 2021; Stern et al., 2019; Wood et al., 2021).

Best practice dictates that OT, PT and SLP professionals integrate HPOT into the patient's plan of care, along with other therapy tools and/or strategies. From the existing literature, we can see that the use of the horse in therapy is an asset due to the facilitating role it plays in this context (Cotton, 2021; Hill, 2020; Mahoney et al., 2021). The horse has a three-dimensional gait that is very similar to the neurophysiological normal human gait pattern, and the back has a structure that promotes an adequate sitting posture (Ajzenman et al., 2013; Cieřla, 2007; Pálsdóttir et al., 2020). There is also an increase in sensory information, which together with the surrounding environment makes the horse a facilitator of development, be it psychomotor, cognitive, social and/or emotional (Araújo et al., 2020; Bass et al., 2009; Cotton, 2021; Mahoney et al., 2021).

The sessions require an intervention made up of certified therapists in HPOT, a horse properly trained for the context and, if necessary, a leader, to fully achieve the objectives outlined (AHA, 2021; AOTA, 2020). In addition, the literature suggests that these teams should be made up of technicians from different areas such as OT, PT, PST and SLP, as well as equine handlers, to ensure that clients benefit from qualified multidisciplinary approaches (Peters et al., 2020; Wood et al., 2021).

According to AHA, the recommended minimum age is approximately 2 years old (AHA, 2021; Weissman-Miller et al., 2017). There are generally no upper limits for age, though medical considerations related to the geriatric patient population need to be strongly considered, as does their motor and sensory tolerance for equine movement and the environment (AHA, 2021; Berardi et al., 2022).

In addition, the literature argues that HPOT is an asset to complement the intervention of various pathologies and diagnoses, such as neurodevelopmental disorders (namely attention deficit hyperactivity disorder, autism spectrum disorder, learning disabilities, intellectual disability, etc.), neurological disorders, Parkinson's and Alzheimer's disease, mental health problems (anxiety, depression, etc.), among others (AHA, 2021; Højgaard-Bøytler & Argentzell, 2023; Mahoney et al., 2021; Pálsdóttir et al., 2020; Shurtleff & Engsborg, 2012; Weissman-Miller et al., 2017). The therapists might opt to use HPOT as a treatment tool if it is suitable for helping the patient achieve positive functional outcomes. This decision is reflective of the therapist's profession, specialized training, clinical reasoning, and theoretical model of treatment (Araújo et al., 2020; Cerquozzi et al., 2007; Wood et al., 2021). Each treatment plan is designed based on the therapist's assessment and the patient's functional goals. The therapist selects a horse and/or equine movement tailored to the patient's specific needs (The Czech Equine Facilitated Therapy

Association, 2021). Throughout the treatment, the therapist continuously monitors the patient's adaptive response and adjusts the equine movement to provide an appropriate challenge, supporting the patient in achieving their functional goals (AOTA, 2020; Angoules et al., 2015; Hill, 2020).

The domain and founding principle of OT as described by the AOTA is that people achieve health and well-being, and participate in life through engagement in occupation (AOTA, 2020). Occupations include Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL), Rest and Sleep, Education, Work, Play, Leisure, and Social Participation (AOTA, 2020). The inclusion of equine movement in an occupational performance-based plan of care is an opportunity to enhance the therapy interventions developed by the OT. An OT-based intervention might include therapeutic exercises for physical components such as postural stability, core strength, ability to change positions safely and grasp strength with dexterity and manipulation (Ajzenman et al., 2013; Du Plessis et al., 2019; Guindos-Sanchez et al., 2020; T. L. Shurtleff et al., 2009). Therapeutic activities aimed at enhancing cognitive skills may include following a multi-step verbal or visual sequence, recalling the need to wash and rinse all parts of the body, and making safety-related decisions in a wet environment (Gilboa & Helmer, 2020; Peters et al., 2020). Psychosocial skills may involve recognizing the appropriate time for bathing and interacting with a caregiver to determine the level of assistance required (Gilboa & Helmer, 2020; Hill, 2020; Højgaard-Bøytler & Argentzell, 2023).

Occupational therapists focus on the performance areas of a person's life including health, well-being, and participation in meaningful activities (Peters et al., 2017). When an occupational therapist evaluates a client's occupational performance, they are analyzing the dynamic interaction between the client, the activity, and the context (AHA, 2020). Recognizing the relationship between the client and their level of engagement in the activity and the meaningfulness of the context guides the process of intervention planning and skilled implementation by the therapist (AHA, 2021; Højgaard-Bøytler & Argentzell, 2023). An effective plan of care includes the current level of performance skills, performance patterns such as habits, routines and roles, and the context or environment where the activities will be performed (AOTA, 2020; Cerquozzi et al., 2007).

An OT sees each person as an occupational being which helps the therapist focus his reasoning perspective on what, how, when, and why of an individual's need for activity (AHA, 2021; AOTA, 2020). Equine movement and the natural environment provide ample opportunities

for treatment interventions with a high level of quality motor input and a rich environment for skill building in a meaningful context (Stern & Chur-hansen, 2019). Documentation from the perspective of OT is crucial because it focuses on understanding clients' occupational needs, strengths, and challenges. By applying the International Classification of Functioning, Disability and Health (ICF) model to health services and treatment outcomes, therapists address impairments and limitations in participating in personally meaningful activities (Wood et al., 2021; World Health Organization, 2003). Progress notes must effectively document therapeutic activities and exercises undertaken by clients, while also emphasizing the impact on occupational performance, skills development, and overall outcomes (Stern & Chur-hansen, 2019; Weissman-Miller et al., 2017).

Ingenuity and resourcefulness, stemming from the viewpoint of humans as occupational beings in need of activity, are essential skills for an effective occupational therapist. (AOTA, 2020; Stern & Chur-hansen, 2019). Creativity within a structured, occupation-centered framework is crucial for successful interventions in OT. Incorporating HPOT can be a valuable component of this framework for well-informed therapists. According to AHA's Best Practice Guidelines, therapists should possess extensive knowledge and clinical reasoning to effectively integrate HPOT into treatment plans (AHA, 2021; Wood et al., 2021).

Occupational therapists (OTs) have extensive training in both cognitive and motor aspects, performing a variety of techniques and strategies that are extremely suitable for activities carried out in this context (AOTA, 2020; Cerquozzi et al., 2007). In addition to the musculoskeletal and cognitive aspects addressed by OTs, the sensory system is also stimulated in the different domains (Cotton, 2021; Peters et al., 2017; 2020). In addition, it uses the diversity and uniqueness of each activity (including handling, grooming, mounting, etc.) to engage the client and increase their motivation, performance and autonomy (AHA, 2021). In this way, the activities required by the therapist during riding aim to improve specific skills aimed at the activity, while the floor activities, in addition to stimulating the training of remaining skills, promote the building of the relationship between the individual, the horse and the therapist (Llambias et al., 2016; Peters et al., 2020; W. Wood et al., 2021). For most patients, the experience of the horse's movement is a novel one, allowing for the development of movement strategies outside of their habitual patterns and moving beyond their wells of stability/compensatory strategies. The equine environment is contextually rich and provides ample functional and motivational opportunities for occupational therapists (Cerquozzi et al., 2007).

Authors of the present study have chosen to develop a scoping review because it is characterized by a relatively new approach to evidence synthesis and currently there exists little guidance regarding the decision to choose between a systematic review or scoping review approach when synthesizing evidence (Munn et al., 2018). The scoping review pretends to identify knowledge gaps, scope a body of literature, clarify concepts or investigate research conduct (Munn et al., 2018). While useful in their own right, scoping reviews may also be helpful precursors to systematic reviews and can be used to confirm the relevance of inclusion criteria and potential questions (Munn et al., 2018). Therefore, the purpose of this scoping review is to analyze, synthesize, and map the current state of existing knowledge regarding interventions implemented and proposed by occupational therapists utilizing hippotherapy as a treatment tool for individuals with transdiagnostic conditions.

Methods

This Scoping Review follows the methodology guidelines proposed by the Joanna Briggs Institute (JBI) Evidence Synthesis – PRISMA-ScR (Tricco et al., 2018), which includes the definition of search expression, eligibility criteria, study selection, characteristics and quality of articles.

Scoping Review is a knowledge synthesis method that comprehensively incorporates different study designs, summarizes and synthesizes evidence, guides research priorities and contributes to advancing knowledge on health care practice, policy and research (Munn et al., 2018; Porritt et al., 2020).

This study was registered on the Open Science Framework (OSF) platform, available from: https://osf.io/k7mt3/?view_only=382653bd16cc4ca1b2ac70ec27de1e0e.

Search terms and search strategy

An electronic search was conducted through health science databases: PubMed, Web of Science and EBSCO. The searches took place on April 2024, using the search words “equine-assisted therapy”, “equine-assisted therapies”, “hippotherapy”, “equine-assisted intervention”, “equine”, “horse”, “equine-assisted” and “occupational therapy” which were linked together using Boolean operators “AND” and linked to synonyms with the operator “OR”. The difference in the way terms are combined in the different databases reflects the specific characteristics and needs of each platform, as well as the most appropriate search strategy to achieve the research objectives. So, the use of different search strategies was made to maximize the relevance and comprehensiveness of the results, adapting to the particularities of each search engine and ensuring that the most pertinent results were included in the analysis.

The research queries were:

PubMed – “Equine-assisted therapy” OR “Equine-assisted therapies” OR “Hippotherapy” OR “Equine-assisted intervention” OR “horse” OR “equine” OR “Equine-assisted” AND “Occupational therapy”.

Web of Science – “Occupational therapy” AND “Equine-assisted therapy” OR “Occupational therapy” AND “Equine-assisted therapies” OR “Occupational therapy” AND “Hippotherapy” OR “Occupational therapy” AND “Equine-assisted intervention” OR “Occupational therapy” AND

“equine” OR “Occupational therapy” AND “horse” OR “Occupational therapy” AND “equine-assisted”.

EBSCO – “Equine-assisted therapy” OR “Equine-assisted therapies” OR “Hippotherapy” OR “Equine-assisted intervention” OR “horse” OR “equine” OR “Equine-assisted” AND “Occupational therapy”.

Eligibility criteria

For the selection of studies, eligibility criteria were defined and determined according to the PCC strategy - Population, Concept and Context (Table 1). Thus, the following inclusion criteria were defined: articles were available in full text, published in Portuguese, Spanish and English, and academic journals indexed in the consulted databases. We chose to restrict the temporal period to articles published in the last 15 years, between 2009–2024. In addition, the included articles must describe OT intervention using hippotherapy in individuals with an associated diagnosis. The scientific evidence in the field of equine-assisted services has changed over the last few years, allowing us to get a more accurate picture of current practices. So, more recent studies generally follow better methodological standards, with new approaches to research design, data analysis and bias control. At the same time, by focusing on recent articles, the present study becomes useful for professionals who need current information for evidence-based practice (AHA, 2021).

As exclusion criteria, we chose to remove all systematic reviews, given the likelihood of duplication of results, as they could cite primary articles already included in this study, occurring redundancy in the data worked, as well as editorial studies and studies that did not specify the occupational therapy intervention and/or hippotherapy as an occupational therapy treatment tool.

Table 1: Eligibility criteria – PCC strategy (population, concept, context) and types of evidence.

Population	Transdiagnostic individuals
Concept	Intervention carried out and target population
Context	Arena (specialized horse centers)
Types of evidence sources	All articles published in scientific journals

Study Selection

The articles identified in the initial search were submitted to a screening divided into two stages, totaling 23 articles that met the inclusion criteria. The steps inherent to the selection process of the studies constituting the sample corpus are described in the flowchart in next Figure 1. Thus, the articles obtained on the search were sorted in alphabetical order and duplicates were excluded, through the Rayyan application (Ouzzani et al. 2016). First, the studies were screened by examining the titles and abstracts of each article to verify the relevance of their inclusion in the review. Two reviewers independently analyzed the articles culled for full-text reading and recorded their evaluation by labelling each study as either relevant (R), irrelevant (I) or doubtful (D). Those in doubt (rated D) were discussed with an additional reviewer until a consensus was obtained.

The search identified 290 potentially relevant studies. Of these, 154 were excluded for being duplicates, leaving 136. The analysis of the title and abstract led to the exclusion of another 64 studies that did not meet the defined inclusion criteria. After reading the full text of the remaining 72 articles, 49 were excluded for not addressing the issue in question, thus determining the inclusion of the remaining 23 articles in this Scoping Review. The quality of the articles was classified using the JBI assessment grids (Porrirt et al., 2020).

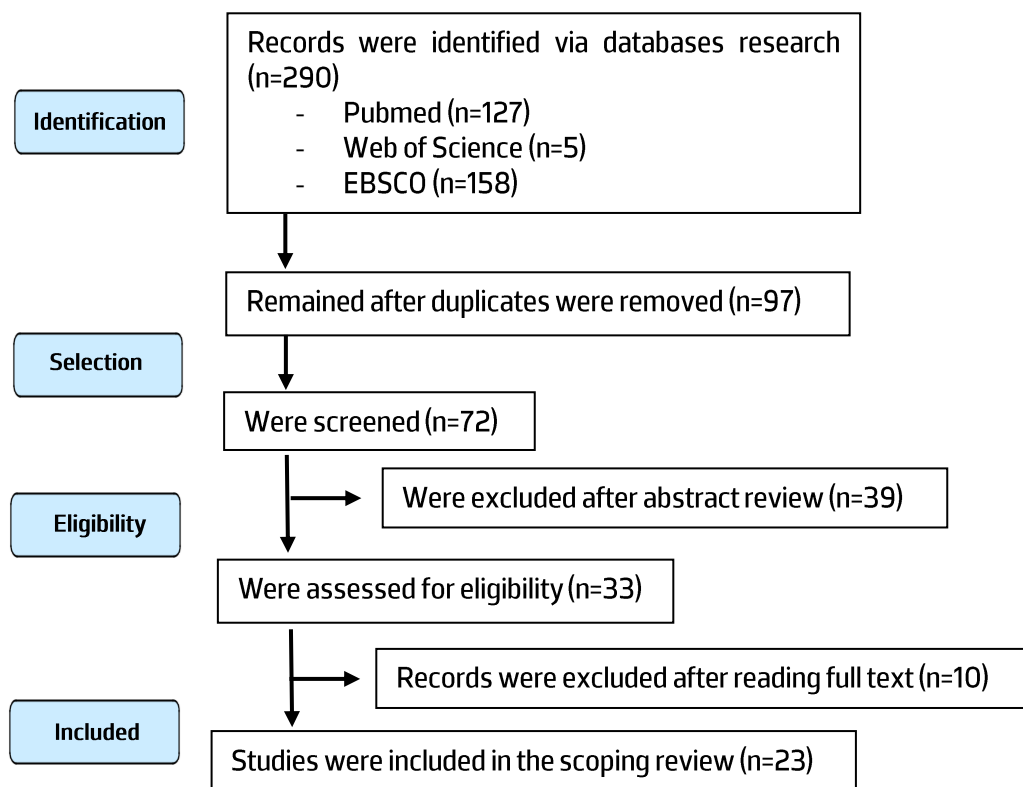


Figure 1: Flowchart of the sample corpus.

Data extraction

Qualitative analysis was conducted using web-based qualitative data analysis software – webQDA, where you can edit, view, link and organize documents. In addition, you can create categories, code, control, filter, search and question the data to answer the questions that arise throughout the research (webQDA, 2022). After the categorization and respective coding, the following questions emerged:

- 1.How does the OTs evaluate using hippotherapy as an OT treatment tool for transdiagnostic individuals?
- 2.How does the OTs intervene in hippotherapy sessions for transdiagnostic individuals?
- 3.What are the results of the OTs intervention using hippotherapy as an OT treatment tool for transdiagnostic individuals?

These allowed for the collection of information from the sample, meeting the defined research question. The data collected from the articles were summarized in Table 2, which includes: author, year, title, type of study, objectives, sample characterization, procedures, assessment tools and main conclusions.

Results

Descriptive summary of the studies

There were 136 articles selected by title and abstract, 72 were included for full reading and inclusion in the present review, and there were 23 articles selected, as shown in Figure 1. Those were published between 2009 and 2024 (table 2), with 17,4% from the year 2020 (n=4), 13,0% from the year 2017 (n=3), 8,7% from the years 2022, 2021, 2019, 2012 and 2009 (n=2 in each year) and finally 4,3% from the years 2024, 2023, 2018, 2016, 2014, 2013 (n=1 in each year).

Table 2: Summary of the data extracted from the selected articles.

Autor, year, title	Type of study and objective	Sample	Procedures	Outcomes	Conclusions
Helmer A, Delore E, Bart O, 2024, <i>"Equine Assisted Occupational Therapy for Children with ADHD (astride): Protocol Development and Preliminary Study"</i>	Pre-post design I) This study reports the development and validation of ASTride (ADHD Skills Therapy): a protocol of Equine-Assisted Occupational Therapy (EAOT) intervention for children with attention deficit hyperactivity disorder (ADHD)	Five children (between 6 and 12 years) with ADHD Non-probability convenience sample	After the baseline assessment participants went through 12 weeks of EAOT intervention according to the ASTride intervention protocol (45 minutes). Each session follows a defined structure that includes setting of riding goals; acquaintance with the horse; tacking and preparing for mounting; warm up; and acquisition and practice of skills and strategy and session summary - Facilitated OTs certified in EAOT	At the end of the intervention, participants completed a post-intervention assessment which included all the measures used in the pre-intervention assessment: Tower of Hanoi Test (TOH) and The Behavior Rating Inventory of Executive Function (BRIEF); The Child Performance Skill Questionnaire (PSQ); The Hebrew adaptation of The Children's Hope Scale, and to occupational performance use The Canadian Occupational Performance Measure (COPM)	This study has found feasibility for the use of ASTride an EAOT intervention for the improvement of cognitive and emotional functions as well as everyday performance in children with ADHD
Højgaard-Bøytle J, Argentzell E, 2023, <i>"Experiences of Equine Assisted Therapy and its Influence on Occupational Engagement Among People with Mental Health Problems"</i>	Qualitative study I) To explore lived experiences with Equine Assisted Therapy (EAT) and its influence on occupational engagement among people with mental health problems receiving this treatment	Eleven adults (between 18 and 68 years old) with mental health problems (anxiety, depression, PTSD, borderline personality disorder, eating disorder, schizophrenia, and ADHD) Non-probability convenience sample	The study was carried out for 15 months, with 1 session per week (60 minutes). Some of the EAT programs included care of the horse and riding, while others included both care of the horse, riding, and stable work or more focus on the interaction and presence with the horses - Facilitated by certificated therapists, including OTs	Interviews were organized with interviews of one to three informants per day. All interviews were conducted individually and face to face, except one that was done by phone. All interviews were carried out by the first author in a separate room at the EAT facility	EAT and the horses enhance personal development and influence occupational engagement positively among people with mental health problems
Nelson C, Dossett K, Walker D, 2022, <i>"Equine-Assisted Therapy for Posttraumatic Stress Disorder Among First Responders"</i>	Pilot study I) Examine the additive benefits of equine-assisted exposure for first responders suffering occupational incapacitation from operational-related	Seven first responders (between 27 and 57 years old), with a pre-established diagnosis of PTSD Non-probability convenience sample	The equine-assisted therapy program consisted of 8 weekly meetings of 90 minutes. Meetings including grooming and leading a horse, mindfulness/grounding exercises, facing obstacles and observation of horses' interaction with one another	Primary Outcome Measures: Anxiety - Generalized Anxiety Disorder-7 (GAD-7); Depression - Patient Health Questionnaire-9 (PHQ-9); Trauma - Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5); Inflexibility and Avoidance - Acceptance and Action Questionnaire-II (AAQ-II), were	Provide important information about the perceived benefits of EAT for first responders and add to the growing literature examining the effectiveness of EAT for PTSD, with significant benefits including increased sense of peace, reduced anxiety, mindfulness, and

	trauma, Posttraumatic Stress Disorder (PTSD)		- Facilitated by 3 licensed EAT instructors and a doctoral clinical psychology student	administered pre- and post-intervention	increased trust in the self and others
Berardi A, Di Napoli G, Ernesto M, Fabbri G, Conte A, Ferrazzano G, Viselli F, Galeoto G., 2022, "The Effectiveness of Equine Therapy Intervention on Activities of Daily Living, Quality of Life, Mood, Balance and Gait in Individuals with Parkinson's Disease"	Prospective clinical trial I) The objective of this study was to evaluate the efficacy of equine therapy (ET) to detect changes in the activities of daily living, quality of life, mood, balance, and gait in individuals with Parkinson's disease (PD)	Seventeen participants (aged up to 85 years old) with PD Non-probability convenience sample	The ET program included 45-minute long sessions that took place twice a week, for 5 weeks. Before starting full activities with the horse, they were required to carry out activities of daily life and to report on how things went. At the end of the 10 sessions, a re-elaboration of the treatment was carried out - Facilitated by specialists in rehabilitation and equine therapy	The outcome measures administered at the beginning and the end of treatment relied on measurements from the Rivermead ADL scale, Parkinson's Disease Questionnaire-39 (PDQ-39), Zung Self-Rating Depression Scale (SDS), unified Parkinson's Disease Rating Scale (UPDRS), and Tinetti balance assessment	In this study, it emerged that ET, as a supportive treatment for traditional treatments, is effective for the recovery of occupational performance, activities of daily life, mood, balance, gait, and quality of life in individuals with PD. This paper could be valuable to practitioners who use ET
Peters B, Wood W, Hepburn S, Moody E, 2022, "Preliminary Efficacy of Occupational Therapy in an Equine Environment for Youth with Autism Spectrum Disorder"	Randomized controlled trial I) Identify appropriate outcome measures and assess the preliminary efficacy of occupational therapy in an equine environment for youth with autism spectrum disorder (ASD)	Twenty-four children (between 6 and 13 years old) with ASD Non-probability convenience sample	10 sessions (60 minutes), with a general structure: greetings, activities with horses, goodbyes, and caregiver debrief. The team developed an intervention manual "Occupational Therapy in an Equine Environment: Harnessing Occupation to Address Self-Regulation, Social Communication, and Play and in Youth with Autism (OTeeHORSPLAY) - Facilitated by certified OTs	Were collected at baseline, after 10 weeks of occupational therapy in a garden environment (waitlist control participants only), and after 10 weeks of OTeeHORSPLAY (all participants). <i>Goal Attainment Scaling (GAS)</i> is a standardized manner used for measuring progress on individual functional goals	This study provides preliminary evidence that horses can be purposefully integrated into occupational therapy intervention for youth with autism to improve social and behavioral goals
Jeon B, Son S, 2021, "Social interaction changes in people with intellectual disabilities through the application of equine-assisted intervention in Korea"	Quasi-experimental study I) Provide basic information about the social interaction changes in people with intellectual disabilities through the application	Twelve participants with intellectual disabilities residing in residential care (average age 24) Non-probabilistic convenience sample	The intervention during 60 minutes, two sessions a week for 12 weeks. EAI include 30 minutes of communal activities (greeting, touching, patting, hugging, grooming, feeding, side walking) and the others 30 minutes of horseback riding (mount and	To determine the psychological aspects of the social interaction changes after the study cohort participated in the EAI: Korean-Social Interaction Anxiety Scale (K-SIAS) and Korean-Social Phobia Scale (K-SPS). To measure their social avoidance and distress,	Social interaction anxiety, social phobia, social avoidance and distress levels were significantly decreased continuously. The EAI included effects on the decrease in anxiety, phobia, avoidance and distress which occur during the

	of equine-assisted intervention (EAI) in Korea		dismount, walk, rising trot, canter up and down activity on the saddle) - Facilitated by certified OTs	the Korean-Social Avoidance and Distress Scale (K-SADS) was used	social interaction process of people with intellectual disabilities
Peters B, Wood W, Hepburn S, Bundy A, 2020, "Pilot Study: Occupational Therapy in an Equine Environment for Youth With Autism"	Multiple baseline single-case I) Pilot a screening, evaluation, and intervention protocol of OT in an equine environment II) Assess preliminary effects on occupational performance goals, behavior, and social functioning of youth with ASD	Six youth (between 6 and 13 years old) with ASD Non-probability convenience sample	Participants attended weekly 45- to 60-minutes session of Occupational Therapy in an Equine Environment (OTEE), for 10 weeks. Sessions include greetings, ground activities, mounted activities, parent debriefs, and goodbyes. OTEE was highly individualized to participants' Goals. OTs provided goal-specific strategies to parents during the debrief - Facilitated by 2 OTs with International Certification	The parents, completed outcome measures before/ after intervention and 3 months after withdrawal: <i>Visual analogue scale</i> (VAS), The Canadian Occupational Performance Measure (COPM); The irritability and hyperactivity subscales of the <i>Aberrant Behavior Checklist-Community</i> (ABC-C) measured extent of problem behaviors; and The <i>Social Responsiveness Scale-2</i> (SRS-2) measured social functioning	This research operationalizes a screening, evaluation, and intervention protocol for OTEE for youth with ASD. Also showed promise for improving occupational performance goals, social motivation and social communication, and decreasing irritability and hyperactivity of some youth
Gilboa Y, Helmer A, 2020, "Self-Management Intervention for Attention and Executive Functions Using Equine-Assisted Occupational Therapy Among Children Aged 6--14 Diagnosed with Attention Deficit/Hyperactivity Disorder"	Pre-post design I) Examine the effectiveness of self-management intervention for attention and executive functions using equine-assisted occupational therapy, for school-aged children with ADHD	Twenty-five children (between 6 and 14 years old) with ADHD Non-probability convenience sample	The intervention consisted of 12 weekly sessions (45 minutes). They spent 10 minutes involved setting the riding objectives and warm-up exercises on the horse; 25 minutes focused on skill acquisition and practice; 10 minutes summarizing the session and planning how to implement functional goals in everyday life; Focusing on child and family-centred strategy acquisition and immediate feedback principles - Facilitated by certified OTs	Their executive functions and occupational performance were evaluated pre and post-intervention, using The Behavior Rating Inventory of Executive Function (BRIEF) and the Canadian Occupational Performance Measure (COPM)	This study suggests that equine-assisted occupational therapy may effectively improve executive functions, occupational performance, satisfaction, and personal functional goals in school-aged children with ADHD. The study's innovative approach combines strategy acquisition with the use of horses to meet the children's everyday needs
Pálsdóttir A, Gudmundsson M, Grahn P, 2020, "Equine-Assisted Intervention to Improve Perceived Value of Everyday"	Randomized controlled trial I) investigate the effects of an equine-assisted intervention on the participants' perceived value of everyday	Fourteen individuals were selected (between 22 and 71 years old). Diagnoses include multiple sclerosis, stroke, muscular disease,	One weekly session for 12 months, (60 – 90 minutes per session active riding maximum of 30 minutes). The first riding event was done individually to provide the opportunity to create a calm and trusting contact, to assess the status	The primary outcome measure was the perceived value of everyday occupations, Occupational Value Assessment (OVAl-pd). The secondary outcome measures were the following Shirom-Melamed Burnout Questionnaire (SMBQ)	Equine-assisted interventions could help to improve the perceived value of everyday occupations and quality of life, as well as break isolation and increase the activity repertoire of people with neurological disorders

<p><i>Occupations and Quality of Life in People with Lifelong Neurological Disorders: A Prospective Controlled Study</i></p>	<p>occupations and health as well as gain a deeper understanding of what the interventions can mean for participants in everyday life</p>	<p>polyneuropathy, fibromyalgia and cerebral palsy Non-probabilistic convenience sample</p>	<p>and the opportunity for equipment adaptation, and for an initial match rider-horse. Then entered into regular activities in a smaller group - Facilitated by certified PTs and OTs</p>		
<p>Martin R, Graham F, Levack W, Taylor W, Surgenor L, 2020, <i>“Exploring how therapeutic horse riding improves health outcomes using a realist framework”</i></p>	<p>Mixed methodology I) To develop an explanatory theory outlining how THR (Therapeutic horse riding) optimises the health outcomes of children and young people who experience disability</p>	<p>Throughout all phases, they collected data from 32 riders, 29 caregivers, 13 THR providers and 3 therapy providers. Riders were aged 5–17 years and had diagnoses including cerebral palsy, autism spectrum disorder, epilepsy, metabolic conditions, dyspraxia, bone disorders, chromosomal disorders, selective mutism, transverse myelitis, traumatic brain injury and global developmental delay Non-probability convenience sample</p>	<p>Phase 1: explored the intervention components, the context and health outcomes of THR; Phase 2: used theory methods to develop a conceptual model explaining how THR might contribute to changed outcomes in riders; Phase 3: A randomized multiple-baseline single-case experimental design, to examine whether a relationship could be demonstrated between the introduction of THR and changes in riders. THR sessions once per week (60 minutes) for 1 year. THR include activities both on and off the horse. Tasks include horse care, riding skills and activities while on the horse - THR providers (include OT)</p>	<p>They used a context–mechanism–outcome (CMO) configuration as a heuristic device to support explanations for how THR might work. First, manual diagramming was used to triangulate findings identified within different research phases, integrating evidence that contributed (or not) to interpretations and explanations within emerging CMO configurations. Those configurations were used as an analytic template, with phase findings and specific cases being compared to test hypothesized relationships between context, mechanisms and outcomes. ‘If-then’ statements and outcomes were constructed to summarise the key CMO configurations</p>	<p>THR provides opportunities for social and occupational participation for disabled children. THR facilitates self-concept development because it focuses on a rider’s capacities and strengths. This study has provided more clarity around the mechanisms of THR treatment effect by proposing an explanatory theory outlining how participation outcomes may be optimised for children experiencing disability</p>
<p>Martin R, Taylor W, Surgenor L, Graham F, Levack W, Blampied N, 2020, <i>“Evaluating the effectiveness of therapeutic horse riding for children and young people experiencing</i></p>	<p>Single-Case Experimental Design Study I) This research evaluated to what extent there was a change in rider’s balance, functional performance, social</p>	<p>Twelve children (between 4 and 18 years) experiencing disability (cerebral palsy, traumatic brain injury, global developmental and transverse myelitis)</p>	<p>Participants received standard THR sessions once/week (70 minutes), for 20 weeks. THR was provided independent of the researcher, to groups of 5–6 riders. THR sessions include leading the horse around the arena, practicing correct postural alignment while completing a range of mounted activities, participating in</p>	<p>Riders are measured over a baseline phase (of 4, 6 or 8 weeks) and then over 20 weeks of riding. Rider’s physical outcome measures include Functional Reach Test (FRT) or Modified Functional Reach Test (MFRT) and Pediatric Balance Scale (PBS). Caregivers completed the Canadian Occupational Performance</p>	<p>Findings suggest that THR may positively impact social participation for children and young people experiencing disability and contribute to an emerging body of evidence exploring participation outcomes as a result of THR. Improvements in participation in home, school and</p>

<p><i>disability: a single-case experimental design study"</i></p>	<p>responsiveness, quality of life and participation outcomes as a result of therapeutic horse riding</p>	<p>Non-probability convenience sample</p>	<p>activities and games while mounted on the horse, and learning riding skills - Facilitated by certified therapists</p>	<p>Measure (COPM), Belief in Goals Self-Competence Scale (BIGGS), KIDSCREEN-10 Index (KS-10), Social Responsiveness Scale (SRS) and Activities Scale for Kids – performance (ASK-p) questionnaires</p>	<p>community settings are significant given participation is considered to be a fundamental health outcome</p>
<p>Plessis N, Buys T, Bruyn J, 2019, <i>"Effect of hippotherapy on physiological cost index and a walking speed of adolescents with diplegia"</i></p>	<p>Quasi-experimental study I) To determine the therapeutic effect of HPOT on Physiological Cost Index (PCI) and walking speed in adolescents with cerebral palsy (CP) diplegia</p>	<p>Ten adolescents with diplegia, between 12 and 17 years old Non-probability convenience sample</p>	<p>Sessions once a week over a 12 weeks (30 minutes). First, participants sit quietly for 15 minutes (heart rate). Then, walk for 3 minutes to allow for cardiovascular adaptation. HPOT is used to address the motor limitations associated with diplegia, such as improving walking speed and reducing the PCI - Facilitated by certified PTs and OTs</p>	<p>Gross Motor Function Classification System (GMFCS), levels I, II and III. Heart rates were recorded with a Polar RCX5 Heart Rate Monitor. Walking speed was measured by two independent observers. Walking speed was calculated over both 30 m distances, excluding the turn. Post-intervention measurements were taken one week after each participant's last intervention session</p>	<p>This study showed that adolescents with CP diplegia can benefit from hippotherapy concerning walking speed and PCI values (decreased significantly)</p>
<p>Johnson R, Albright D, Marzolf J, Bibbo J, Yaglom H, Crowder S, Carlisle G, Willard A, Russell C, Grindler K, Osterlind S, Wassman M, Harms N, 2018, <i>"Effects of therapeutic horseback riding on posttraumatic stress disorder in military veterans"</i></p>	<p>Randomized Controlled Trial I) This article aims to measure changes in PTSD (posttraumatic stress disorder) symptoms, coping self-efficacy, emotion regulation, and social and emotional loneliness among military veterans through the therapeutic horseback riding (THR) program</p>	<p>Twenty-nine military veterans (age 18 years or older) with PTSD Non-probability convenience sample</p>	<p>THR sessions once per week for 6 weeks (60 minutes). The wait-list control group experienced a 6-week waiting period, while the horse-riding group began THR. The wait-list control group began riding after 6 weeks of participating in the control group. During the THR sessions, veterans learned basic horsemanship skills and completed tasks on horseback - Facilitated by a certified riding instructor and supervised by an OT</p>	<p>PTSD symptoms were measured using the standardized PTSD Checklist-Military Version (PCL-M). The PCL-M as well as other instruments including, The Coping Self Efficacy Scale (CSES), The Difficulties in Emotion Regulation Scale (DERS) and The Social and Emotional Loneliness Scale for Adults-short version (SELSA) were used to access different aspects of individual well-being and the PTSD symptoms. Baseline data collection occurred before any participant began the THR sessions</p>	<p>They have concluded that they have improved the existing knowledge base on THR, a beneficial intervention for veterans with PTSD, by identifying a clinically meaningful dosage of THR. The findings suggest that THR may be a clinically effective intervention for alleviating PTSD symptoms in military veterans</p>
<p>Heffernan, K, 2017, <i>"The effect of an equine assisted</i></p>	<p>Pilot study I) To investigate the impact of a specific six-</p>	<p>Ten children with a diagnosis of a visual impairment, and some</p>	<p>Six-week EAT sessions, one session per week (90 minutes). Stable work (sensory input) and next put horses'</p>	<p>The Canadian Occupational Performance Measure (COPM) was administered to parent's pre-</p>	<p>This study provides preliminary evidence that an EAT intervention may enhance some children's</p>

<p>therapy (EAT) programme on children's occupational performance – a pilot study”</p>	<p>week EAT programme on six participants' occupational performance</p>	<p>had additional diagnoses (between 5 and 10 years old) Non-probability convenience sample</p>	<p>equipment. On horse engaged in coordination and body awareness activities, sensory inputs, participated in teamwork and social interaction games, fine motor and attention activities – A minimum of one certified OT</p>	<p>programme, post-programme and approximately six weeks after the program ceased</p>	<p>occupational performance. Children's and parents' reports suggest interaction skills and volition may also be impacted. Overall, EAT was viewed positively by all participants which is a consistent trend in the literature</p>
<p>Weissman-Miller D, Miller R, Shotwell M, 2017, “<i>Translational Research for Occupational Therapy: Using SPRE in Hippotherapy for Children with Developmental Disabilities</i>”</p>	<p>Single-subject design I) Enhance the understanding of outcomes in OT, particularly using HPOT as an intervention for children with developmental disabilities (DD). Translational research approach by utilizing the Semiparametric Ratio Estimator (SPRE)</p>	<p>Twenty-one children, between the ages of 2 and 19 years with DD, who were engaged in hippotherapy services Non-probability convenience sample</p>	<p>Data were collected over 14 weeks during hippotherapy sessions using the HEAT (45 minutes). SPRE, a single-subject statistical and small data science model, is used to derive a “change point” indicating where the participant adapts to treatment, from which predictions are made – Facilitated by certificated occupational therapists</p>	<p>Data analyzed here is from an institutional review board-approved pilot study using the HEAT measure, where outcomes are given separately for each of the four measured domains and the total scores of each participant. The Pediatric Evaluation of Disability Inventory (PEDI) was also administered during the first and last sessions</p>	<p>SPRE model effectively provides new insights into HPOT outcomes for children with DD. The study highlights that using SPRE in OT research can bridge the gap between traditional data analysis methods and more nuanced, individualized assessments. This approach enhances the evaluation of therapy outcomes and contributes to building a more robust evidence base for HPOT practices</p>
<p>Bunketorp-Käll L, Lundgren-Nilsson Å, Samuelsson H, Pekny T, Blomvé K, Pekna M, Pekny M, Blomstrand C, Nilsson M, 2017, “<i>Long-Term Improvements After Multimodal Rehabilitation in Late Phase After Stroke: A Randomized Controlled Trial</i>”</p>	<p>Randomized Controlled Trial I) To evaluate whether multimodal interventions based on rhythm-and-music therapy (R-MT) or horse-riding therapy (H-RT) could lead to increased perceived recovery and functional improvement in a mixed population of individuals in late phase after stroke</p>	<p>One hundred twenty-three adults (between 50 and 75 years old) who had their stroke \geq 10 months and \leq 5 years before enrollment, were assigned to R-MT (n=41), H-RT (n=41), or control (n=41) Non-probability convenience sample</p>	<p>H-RT: 2 x 240-minute sessions each week for 12 weeks. Each session consisted of riding and time for interaction with the horse either before or after the riding. The H-RT included the preparation of the horse. Groups of 2-6 participants rode in pairs for 30 minutes. Throughout the lesson, riders engaged in specific exercises individually tailored to their physical needs and horse-riding ability; all exercises were, if possible, performed while the horse was moving</p>	<p>Evaluation in baseline, directly at the end of the 12-week-long intervention, and at 3 and 6 months post-intervention. Measure the individual's global perception of stroke recovery, using Stroke Impact Scale (SIS). Gait and balance were measured with the Timed Up and Go test; the Berg Balance Scale; and the Bäckstrand, Dahlberg and Liljenäs Balance Scale (BDL-BS). Hand strength was measured with Grippit, general cognitive level was measured with the Barrow Neurological Institute screen for</p>	<p>This study demonstrates that multimodal rehabilitation can lead to meaningful and sustained improvement when applied to individuals with moderate levels of disability in the late poststroke stage. It also shows the promise of using different modality combinations to address the individual needs of stroke survivors. These results support long-term engagement in multimodal rehabilitation programs for individuals with persistent disabilities after stroke</p>

			- Facilitated by a physiotherapist and an OT specialized in H-RT as well as in stroke rehabilitation	higher cerebral functions, and working memory was measured with the letter-number sequencing test	
Llambias C, Magill-Evans J, Smith V, Warren S, 2016, <i>"Equine-Assisted Occupational Therapy: Increasing Engagement for Children With Autism Spectrum Disorder"</i>	Multiple-baseline study I) Investigate the effects of equine-assisted occupational therapy on the engagement of young children with ASD	Seven children (between 4 and 8 years old) with ASD Non-probability convenience sample	The intervention lasted 4 months with one session per week (45-60 minutes) with 3 phases: baseline, intervention and follow-up. In session, they spent ≥ 20 minutes in gross motor (GM) or physical activities (on horse) and 20 minutes in fine motor (FM) or cognitive activities (off horse) - Facilitated by Ots certified in EAOT	Engagement was measured based on the child's response to the therapist's requests. The percentage of time engaged during a randomly selected segment was used as the outcome measure. GM (on-horse) and FM (off-horse) activity percentages were averaged to provide a single value per session	EAOT increases engagement in adult-led activities. Indicates that it's not only the presence of the beneficial animal, but also the combination of specific techniques and strategies together with the attraction and characteristics of the animal that make therapy an effective intervention
Holm M, Baird J, Kim Y, Rajora K, D'Silva D, Podolinsky L, Mazefsky C, Minshew N, 2014, <i>"Therapeutic Horseback Riding Outcomes of Parent-Identified Goals for Children with Autism Spectrum Disorder: An ABA 'Multiple Case Design Examining Dosing and Generalization to the Home and Community"</i>	Multiple Case Design I) To examine whether different doses of therapeutic riding influenced parent-nominated target behaviors of children with ASD (a) during the session (b) at home, and (c) in the community.	Three boys with ASD (between 5 and 13 years old) Non-probability convenience sample	The study used an ABA' single-subject design, with each phase lasting 4 weeks and the entire study lasting 12 weeks. In the Baseline phase (A) the participants received 1 session (30-45 minutes) of THR. In the Intervention phase (B) they received either 1 (control dose), 3, or 5 sessions per week. In the Withdrawal phase (A') all participants returned to their usual 1 session per week routine - Facilitated by certified and registered therapist (including OT)	Standardized measures of change were completed four times by the parents, each time with a look-back period of 1 month: Pre-study (Pre-Baseline), Post-phase A (Baseline), Post-phase B (Intervention), and Post-phase A' (Withdrawal). Screening with the Childhood Autism Rating Scale (CARS); Social Responsiveness Scale (SRS); Sensory Profile-Caregiver Questionnaire (SP-CQ)	Compared to the baseline the target behaviors were better during intervention and improvement was retained during withdrawal. Increased doses of therapeutic riding were significant for the magnitude of change, and the effect of the therapeutic riding sessions generalized to home and community
Ajzenman F, Standeven J, Shurtleff T, 2013, <i>"Effect of Hippotherapy on Motor Control, Adaptive Behaviors,</i>	Pre-post design I) Determine whether hippotherapy increased function and participation in children with ASD, and improved motor control, which	Six children (between 5 and 12 years) with ASD Non-probability convenience sample	The intervention consisted of 45 minutes mounted on a therapy horse (1 session per week during 12 weeks). A hippotherapy treatment progression strategy was developed and used for intervention (5 domains): motor control, functional	Measures pre and post-hippotherapy included the Vineland Adaptive Behavior Scales-II (VABS II) and the Child Activity Card Sort (CACS). Motor control was measured preintervention and postintervention	Children with ASD showed improved postural stability and improvements in receptive communication, coping and daily activity participation after sessions. Hippotherapy has the potential to increase postural

<i>and Participation in Children With Autism Spectrum Disorder: A Pilot Study'</i>	could increase adaptive behaviors and participation in daily activities		communication, cognition, social skills and interactive play - Facilitated by OTs certified in HPOT	using a video motion capture system and force plates	stability, providing children with ASD the opportunity to increase performance and participation in daily activities
Encheff J, Armstrong C, Masterson M, Fox C, Gribble P, 2012 <i>"Hippotherapy Effects on Trunk, Pelvic, and Hip Motion During Ambulation in Children with Neurological Impairments"</i>	Quasi-experimental study I) To investigate the effects of a 10-week hippotherapy program on trunk, pelvis, and hip joint positioning during the stance phase of gait	Eleven children (between 3 and 12 years old) with neurological disorders that resulted in impairments in ambulation Non-probability convenience sample	Once weekly 45-minute HPOT sessions for a total of 10 sessions (12-week time span). Proper posture in sitting was emphasized throughout the sessions and upper extremity (UE), reaching tasks, and general active range of motion (ROM) were incorporated along with lower extremity (LE) exercises. Trunk exercises included activities such as leaning forward or backward - Facilitated by certified therapists (including OT)	During trials, an 8-camera 3-D motion capture system was used to track the movements of the subjects as they ambulated at self-selected speeds. EVaRT 7.0 software was used for video and analog data acquisition and processing. An average of 16 gait trials was performed by subjects at post-testing, and joint positions and ROM excursion for the trunk, pelvis, and hips were then compared pre- to post-HPOT across the group	A trend toward a more normalized sagittal plane pelvic position during gait was observed after HPOT and most likely influenced the corresponding improvements in alignment of the trunk and hips in the sagittal plane during gait. Improved pelvic postural control in sitting can be improved in standing postural control as proximal stability allows for enhanced distal movement and control
Shurtleff T, Engsborg J, 2012, <i>"Long-term effects of hippotherapy on one child with cerebral palsy: a research case study"</i>	Pilot study I) To quantify changes in head and trunk stability in a child with CP over 36 weeks of weekly HPOT	One 6-year-old child with CP Non-probabilistic convenience sample	The child had weekly sessions (45 minutes) for 36 weeks. HPOT include: mounted sessions in walk and trot in various positions, Upper extremity functional tasks, games and exercises (while the horse is moving), challenging trunk and head stability - Facilitated by OT certified in HPOT	Pre-post measures were performed using a video motion capture system before and after 12 weeks, showing head/trunk control improvements	Identifies changes in outcomes that were not noticeable during the initial 12-week period. Changes became evident after the 6-12 weeks in head and trunk stability. The increased stability resulting from HPOT may, therefore, make the UE more available to perform the occupations of everyday life
Bass M, Duchowny C, Llabre M, 2009, <i>"The Effect of Therapeutic Horseback Riding on Social Functioning in Children with Autism"</i>	Randomized controlled trial I) Evaluate the effects of therapeutic horseback riding on social functioning in children with ASD	Thirty-four children diagnosed with ASD – experimental group (19 children between 5 and 10 years old) and control group (15 children between 4 and 10 years old) Non-probabilistic convenience sample	Each child received a therapeutic riding session (60 minutes) per week for 12 weeks. THR sessions include: mounting/dismounting; warm-up exercises; riding skills and mounted games; and horsemanship activities - Facilitated by certified therapists, staff at the Good Hope Equestrian Training Center (GHETC)	The Social Responsiveness Scale (SRS) and Sensory Profile (SP) were used to assess social functioning at pre and post-intervention	The study provide evidences that therapeutic horseback riding may be a viable therapeutic option in treating children with ASD, with a significant impact on their social functioning

<p>Shurtleff T, Standeven J, Engsberg J, 2009, <i>“Changes in Dynamic Trunk/Head Stability and Functional Reach After Hippotherapy”</i></p>	<p>Quasi-Experimental Design I) To determine if hippotherapy improves head/trunk stability and upper extremity (UE) reaching/targeting in children with spastic diplegia cerebral palsy (SDCP).</p>	<p>Nineteen children (between 5 and 13 years old), eleven with SDCP and 8 without disabilities Non-probabilistic convenience sample</p>	<p>1 session per week for 12 weeks. 45 minutes mounted on a moving horse in walk and/or trot performing various positions, UE activities, stretches, cognitive games, and exercises were included - Facilitated by physical or occupational therapists certified in HPOT</p>	<p>Outcome testing was performed within 2 weeks before beginning the HPOT intervention, within 2 weeks after completion, and 12 to 14 weeks post-intervention. The main outcome measures are video motion capture using surface markers collecting data at 60 Hz, a mechanical barrel to challenge trunk and head stability, and a functional reach/targeting test on a static surface</p>	<p>Hippotherapy improves trunk/head stability and UE reaching/targeting. These skills form the foundation for many functional tasks. Changes are maintained after the intervention ceases providing a skill foundation for functional tasks that may also enhance occupational performance and participation</p>
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Narrative summary of the studies

Analyzing the 23 articles, it is possible to verify that the participants cover a wide age range, between 2 and 85 years of age, with 69,56% of the studies being only with children (n=16), with 13,04% of the studies being adults and elderly (n=3), 8,70% included children and adults and elderly (n=2) and the others 8,70% only elderly (n=2).

According to the guidelines of the fourth edition of the Occupational Therapy Practice Framework: Domain and Process, the work developed by the OT in these studies, can be divided into three moments: assessment, intervention, and results obtained (client satisfaction with the process and interventional effectiveness) (WFOT, 2014)(Table 3).

Table 3: Categories and subcategories taken from the content analysis.

Qualitative analysis					
Categories	Questions	Subcategories	Questions	References	Sources
Process of OT interventions using HPOT as an OT treatment tool for transdiagnostic individuals	What is the contribution of the OT process in interventions using HPOT as a treatment tool for transdiagnostic individuals?	Assessment	How does the Ots evaluate using HPOT as an OT treatment tool for transdiagnostic individuals?	6	2
		Intervention	How do the OTs intervene in HPOT sessions for transdiagnostic individuals?	44	36
		Results	What are the outcomes of the OTs intervention using HPOT as an OT treatment tool for transdiagnostic individuals?	42	36

Regarding the assessment used in HPOT sessions, the results identified that in the two articles the assessments were conducted following the administration of standardized and non-standardized evaluation instruments to assess the participants (Peters et al., 2020; Weissman-Miller et al., 2017). In a study by Weissman-Miler et al. (2017), authors developed The Hippotherapy Evaluation and Assessment Tool (HEAT), in response to the need for a comprehensive assessment to measure the outcomes of HPOT The HEAT contain four domains: (a) dynamic motor behavior, (b) static posture, (c) sensory processing, and (d)

psychosocial/behavioral performance (Weissman-Miller et al., 2017). Similarly, the authors of the two studies used standardized instruments to assess the respective populations and diagnoses under study before and after the intervention (Peters et al., 2020; Weissman-Miller et al., 2017).

Regarding the intervention utilizing HPOT as an OT treatment tool, the results of the present study indicate that the type of intervention most used by OTs is the Therapeutic-Use of Occupations and Activities – Occupation-Based Intervention and Purposeful Activities, corresponding to 100% (n=23) (Ajzenman et al., 2013; Bass et al., 2009; Berardi et al., 2022; Bunketorp-Käll et al., 2017; Du Plessis et al., 2019; Encheff et al., 2012; Gilboa & Helmer, 2020; Heffernan, 2017; Helmer et al., 2024; Højgaard-Bøytler & Argentzell, 2023; Holm et al., 2014; Jeon & Son, 2021; Johnson et al., 2018; Llambias et al., 2016; Martin, Graham, et al., 2020; Martin, Taylor, et al., 2020; Nelson et al., 2022; Pálsdóttir et al., 2020; Peters et al., 2020, 2022; T. Shurtleff & Engsberg, 2012; T. L. Shurtleff et al., 2009; Weissman-Miller et al., 2017). The Education Process corresponding to 70% (n=16) of the interventions, includes all the articles in which, in addition to the participants benefiting from the horse-riding activity, they also spent part of the session learning/developing skills in working on the ground (e.g. handling, grooming, stable work) (Bass et al., 2009; Berardi et al., 2022; Bunketorp-Käll et al., 2017; Gilboa & Helmer, 2020; Heffernan, 2017; Helmer et al., 2024; Højgaard-Bøytler & Argentzell, 2023; Jeon & Son, 2021; Johnson et al., 2018; Llambias et al., 2016; Martin, Graham, et al., 2020; Martin, Taylor, et al., 2020; Nelson et al., 2022; Pálsdóttir et al., 2020; Peters et al., 2020, 2022), followed by the Intervention in Groups used in 7% of the interventions (n=2) (Bunketorp-Käll et al., 2017; Johnson et al., 2018).

During the sessions, participants benefit from a) initial warm-up activities, which can be performed on the ground, such as handling, grooming, stable work, training in activities of daily living and instrumental activities of daily living (Ajzenman et al., 2013; Berardi et al., 2022; Gilboa & Helmer, 2020; Helmer et al., 2024; Højgaard-Bøytler & Argentzell, 2023; Jeon & Son, 2021; Peters et al., 2020, 2022); or on horseback, such as exercises/motor sequences for warming up the body and adapting to the horse's movement (Ajzenman et al., 2013; Bass et al., 2009; Helmer et al., 2024); b) main activities, such as coordination and body awareness activities (Ajzenman et al., 2013; Heffernan, 2017; Helmer et al., 2024); teamwork/social interaction games (Heffernan, 2017); attention and cognition activities (Heffernan, 2017; Llambias et al., 2016; T. L. Shurtleff et al., 2009); fine motor and gross motor activities (Heffernan, 2017; Llambias et al., 2016); sensory inputs while the horse is moving at a walk and/or trot, performing various positions, often with

transitions between positions; and/or riding skills (Bass et al., 2009); and finally c) final/concluding activities, which may include relaxation activities (Berardi et al., 2022); gait training (Ajzenman et al., 2013); horse care (Berardi et al., 2022); and/or summarizing the session and planning how to implement functional goals in everyday life (Berardi et al., 2022; Gilboa & Helmer, 2020; Peters et al., 2020).

The intervention period ranged from 5 weeks (Berardi et al., 2022) to 60 weeks (Højgaard-Bøytler & Argentzell, 2023), with the average author carrying out the intervention for 12 weeks (n=10) (Ajzenman et al., 2013; Bass et al., 2009; Bunketorp-Käll et al., 2017; Du Plessis et al., 2019; Encheff et al., 2012; Gilboa & Helmer, 2020; Helmer et al., 2024; Holm et al., 2014; Jeon & Son, 2021; T. L. Shurtleff et al., 2009). The duration of each HPOT session varies between 30 minutes (Du Plessis et al., 2019) and 90 minutes (Heffernan, 2017; Nelson et al., 2022) corresponding to 4,3% (n=1), respectively, and in the two articles that carried out an intervention with groups of elderly people and veterans the session lasted 240 minutes (Bunketorp-Käll et al., 2017) and 90 minutes respectively, also corresponding to 4,3% (n=1) each one (Nelson et al., 2022). The majority of studies, corresponding to 47,8% (n=11), carried out HPOT intervention during 45 minutes (Ajzenman et al., 2013; Berardi et al., 2022; Encheff et al., 2012; Gilboa & Helmer, 2020; Helmer et al., 2024; Holm et al., 2014; Llambias et al., 2016; Peters et al., 2020; T. Shurtleff & Engsberg, 2012; T. L. Shurtleff et al., 2009; Weissman-Miller et al., 2017). Other authors carried out HPOT sessions lasting at least 60 minutes, corresponding to 30,4% (n=7) (Bass et al., 2009; Højgaard-Bøytler & Argentzell, 2023; Jeon & Son, 2021; Johnson et al., 2018; Martin, Graham, et al., 2020; Pálsdóttir et al., 2020; Peters et al., 2022) and only one reported a 70 minutes intervention, corresponding to 4,3% (n=1) (Martin, Taylor, et al., 2020).

Furthermore, analyzing the number of weekly sessions each participant had, we found that 83% of the authors had weekly OT sessions using HPOT as an OT treatment tool (n=19) (Ajzenman et al., 2013; Bass et al., 2009; Du Plessis et al., 2019; Encheff et al., 2012; Gilboa & Helmer, 2020; Heffernan, 2017; Helmer et al., 2024; Højgaard-Bøytler & Argentzell, 2023; Johnson et al., 2018; Llambias et al., 2016; Martin, Graham, et al., 2020, 2020; Nelson et al., 2022; Pálsdóttir et al., 2020; Peters et al., 2020, 2022; T. Shurtleff & Engsberg, 2012; T. L. Shurtleff et al., 2009; Weissman-Miller et al., 2017), with the remaining 17% having two or more weekly sessions (n=4) (Berardi et al., 2022; Bunketorp-Käll et al., 2017; Holm et al., 2014; Jeon & Son, 2021). In the article by Holm et al. (2014), in one of the intervention phases lasting four weeks (out of a total of twelve weeks), the participants had between three and five weekly sessions.

Regarding the participants' diagnoses, we found that the highest percentage concerns autism spectrum disorder, corresponding to 27% of articles (n=6) (Ajzenman et al., 2013; Bass et al., 2009; Holm et al., 2014; Llambias et al., 2016; Peters et al., 2020, 2022); followed by disability/transdiagnosis (include multiple sclerosis, muscular disease, polyneuropathy, epilepsy, metabolic condition, dyspraxia, bone disorders, chromosomal disorder, selective mutism, transverse myelitis, traumatic brain injury, global development delay) with 23% (n=5) (Jeon & Son, 2021; Martin, Graham, et al., 2020, 2020; Pálsdóttir et al., 2020; Weissman-Miller et al., 2017); neurological disorders (include cerebral palsy) with 17% (n=4) (Du Plessis et al., 2019; Encheff et al., 2012; T. Shurtleff & Engsborg, 2012; T. L. Shurtleff et al., 2009); mental health problems (include anxiety, depression, eating disorders, posttraumatic stress disorder, borderline, personality disorder) with 13% (n=3) (Højgaard-Bøytler & Argentzell, 2023; Johnson et al., 2018; Nelson et al., 2022); attention deficit hyperactivity disorder with 8% (n=2) (Gilboa & Helmer, 2020; Helmer et al., 2024); and Parkinson's disease (Berardi et al., 2022), rehab after stroke (Bunketorp-Käll et al., 2017) and visual impairment (Heffernan, 2017), each one corresponding to 4% (n=1 each one).

All the articles provided an OT intervention using HPOT as an OT treatment tool, describing an intervention facilitated by a certified health professional (some of them benefited from the intervention of a multidisciplinary team with OT, PT and/or SLP), and all the therapists had to have proven certification to practice HPOT (e.g. AHA Inc Certification or PATH Inc Certification) (Bass et al., 2009; Berardi et al., 2022; Bunketorp-Käll et al., 2017; Du Plessis et al., 2019; Encheff et al., 2012; Holm et al., 2014; Martin, Graham, et al., 2020; Martin, Taylor, et al., 2020; Nelson et al., 2022; Pálsdóttir et al., 2020; T. L. Shurtleff et al., 2009).

Finally, the results of the OT intervention using HPOT as an OT treatment tool showed a positive impact regardless of diagnosis and age group, namely on occupational performance (Ajzenman et al., 2013; Du Plessis et al., 2019; Encheff et al., 2012; Heffernan, 2017; Højgaard-Bøytler & Argentzell, 2023; Johnson et al., 2018; Martin, Graham, et al., 2020; Martin, Taylor, et al., 2020; Pálsdóttir et al., 2020; Peters et al., 2020; T. Shurtleff & Engsborg, 2012; Weissman-Miller et al., 2017) and occupational participation (Ajzenman et al., 2013; Encheff et al., 2012; T. L. Shurtleff et al., 2009), as well as in the quality of life (Berardi et al., 2022; Martin, Graham, et al., 2020; Pálsdóttir et al., 2020) and occupational performance patterns (namely in the roles) (Højgaard-Bøytler & Argentzell, 2023; Martin, Graham, et al., 2020; Pálsdóttir et al., 2020). Specifically, the authors reported significant improvements in various performance skills and

underlying capacities (functions) that support occupational performance, namely in cognitive functions (Helmer et al., 2024); emotional functions and temperament and personality functions (Helmer et al., 2024; Jeon & Son, 2021; Johnson et al., 2018; Peters et al., 2020); executive functions (Gilboa & Helmer, 2020); movement functions, specifically in terms of gait patterns (Du Plessis et al., 2019; T. L. Shurtleff et al., 2009) involuntary motor reactions (postural reactions) (Encheff et al., 2012) and joint stability (Ajzenman et al., 2013; T. L. Shurtleff et al., 2009).

Some studies have reported that increased doses of therapeutic riding were significant for magnitude of change, and the effect of the therapeutic riding sessions allowed improvements in participation and occupational performance, generalized to home and community (Holm et al., 2014; T. Shurtleff & Engsberg, 2012).

Discussion

The research question that guides the present study aims to realize “What is the contribution of the OT process in interventions using HPOT as a treatment tool for transdiagnostic individuals?” to aggregate information on good practices for the profession, namely on the results obtained with the assessment and interventions using HPOT as a treatment tool.

The categories that emerged allowed us to classify them into three categories, (1) OT assessment in HPOT, (2) OT intervention in HPOT; and (3) results of the intervention.

Regarding the first category, there were no differences in the OT assessment process when the intervention was conducted in the context of HPOT. As in conventional OT, the therapist also performs a client-centred, evidence-based, and context-adapted assessment (AOTA, 2020), independently of participants’ diagnoses and age groups. This scoping review allowed us to observe that some authors base their assessments on standardized and non-standardized instruments to evaluate participants before and after a specific intervention period (Peters et al., 2020; Weissman-Miller et al., 2017). Some of them use assessment tools adapted to the context of HPOT, assessments that can be used to measure patient’s progress through a variety of movement and behavioral-based domains (Shotwell et al., 2017), allowing a better understanding of the actual difficulties in performing the proposed activities (Weissman-Miller et al., 2017). Based on the literature reviewed, we also found that some authors support outcomes through video motion capture system records (Ajzenman et al., 2013; Du Plessis et al., 2019; Encheff et al., 2012; T. Shurtleff & Engsberg, 2012). We can consider that in HPOT these systems play a

significant role in the assessment process, as they provide an objective and detailed evaluation of both the client's and the horse's movements, enhancing movement analysis and visual feedback while complementing standardized and non-standardized assessment instruments (Ajzenman et al., 2013; Du Plessis et al., 2019; Encheff et al., 2012; T. Shurtleff & Engsborg, 2012).

Regarding the type of intervention of OT using HPOT as an OT treatment tool, the "Therapeutic Use of Occupations and Activities – Occupation-Based Intervention and Purposeful Activities" is the one that appears most often in the studies included in this review (Ajzenman et al., 2013; Bass et al., 2009; Berardi et al., 2022; Bunketorp-Käll et al., 2017; Du Plessis et al., 2019; Encheff et al., 2012; Gilboa & Helmer, 2020; Heffernan, 2017; Helmer et al., 2024; Højgaard-Bøytler & Argentzell, 2023; Holm et al., 2014; Jeon & Son, 2021; Johnson et al., 2018; Llambias et al., 2016; Martin, Graham, et al., 2020; Nelson et al., 2022; Pálsdóttir et al., 2020; Peters et al., 2020, 2022; T. Shurtleff & Engsborg, 2012; T. L. Shurtleff et al., 2009). A possible explanation for this may have to do with the fact that this type of intervention is, on the one hand, directed at the meaningful occupations and goals outlined for each client, regardless of diagnosis and age group. At the same time, this type of intervention is effective in the HPOT context because it creates a natural, dynamic, and motivating therapeutic environment, where the patient is engaged in meaningful activities that promote the acquisition and generalization of functional skills (Ajzenman et al., 2013; Berardi et al., 2022; Cerquozzi et al., 2007; Gilboa & Helmer, 2020; Helmer et al., 2024; Pálsdóttir et al., 2020; Peters et al., 2022). The same happens with the remaining types of intervention identified, the "Education Process" (Bass et al., 2009; Berardi et al., 2022; Bunketorp-Käll et al., 2017; Gilboa & Helmer, 2020; Heffernan, 2017; Helmer et al., 2024; Højgaard-Bøytler & Argentzell, 2023; Jeon & Son, 2021; Johnson et al., 2018; Llambias et al., 2016; Martin, Graham, et al., 2020; Nelson et al., 2022; Pálsdóttir et al., 2020; Peters et al., 2020, 2022) and "Intervention in Group" (Bunketorp-Käll et al., 2017; Johnson et al., 2018). In addition, it's not only the presence of the beneficial animal, but also the combination of specific techniques and strategies together with the attraction and characteristics of the animal that make HPOT an effective intervention (Cerquozzi et al., 2007).

Shotwell et al (2017), found that 45% of the literature discussed dynamic motor performance as an outcome of hippotherapy, 20% of the literature showed improvements in a static posture, 20% of the articles represented changes in sensory processing, and the smallest percentage of outcomes (15%) was represented by psychosocial or behavioral changes (regardless of the area of expertise). In this scoping review, we can see from the results in Table 2 that most authors

report improvements in psychosocial and behavioral levels, as well as in motor functions in participants with different diagnoses and age groups (Ajzenman et al., 2013; Bass et al., 2009; Berardi et al., 2022; Du Plessis et al., 2019; Encheff et al., 2012; Gilboa & Helmer, 2020; Helmer et al., 2024; Holm et al., 2014; Jeon & Son, 2021; Johnson et al., 2018; Martin, Graham, et al., 2020; Martin, Taylor, et al., 2020; Nelson et al., 2022; Peters et al., 2020, 2022; T. Shurtleff & Engsberg, 2012; T. L. Shurtleff et al., 2009). As far as sensory functions are concerned, although they are directly influenced by the horse's movement and sensory inputs from the context, none of these authors studied them. A study by Cotton (2021), which aimed to examine the effect of hippotherapy on sensory integration among children with ASD, describes that the greatest impact of the intervention was on arousal, sensory discrimination and sensory modulation. It also found that occupational therapy using HPOT as an OT treatment tool can be highly motivating and enjoyable for participants and may be a viable intervention for OTs recommended for clients who would benefit from a multisensory approach (Cotton, 2021). This intervention resulted in improved sensory integration as well as better adaptive responses when applying higher-level skills in occupational contexts outside of therapy (Cerquozzi et al., 2007; Cotton, 2021). However, restricted access to this and other studies impacts not only the process of mapping the literature, but also the recommendations and conclusions drawn.

In addition, the authors reported improvements/results in several performance competencies and underlying capacities that support occupational performance (Ajzenman et al., 2013; Du Plessis et al., 2019; Encheff et al., 2012; Heffernan, 2017; Højgaard-Bøytler & Argentzell, 2023; Johnson et al., 2018; Martin, Graham, et al., 2020; Martin, Taylor, et al., 2020; Pálsdóttir et al., 2020; Peters et al., 2020; T. Shurtleff & Engsberg, 2012; Weissman-Miller et al., 2017). The context of hippotherapy offers a unique combination of sensory stimulation, movement, emotional interaction and physical and cognitive engagement, which acts on multiple underlying competencies (Cotton, 2021; Peters et al., 2017; Peters et al., 2020). Similarly, the frequency and duration of hippotherapy sessions are directly related to the potential for improvements in performance skills and the underlying capacities that support occupational performance (Ajzenman et al., 2013; Bass et al., 2009; Bunketorp-Käll et al., 2017; Du Plessis et al., 2019; Encheff et al., 2012; Gilboa & Helmer, 2020; Helmer et al., 2024; Holm et al., 2014; Jeon & Son, 2021; T. L. Shurtleff et al., 2009). On the one hand, regular attendance at sessions is essential to promote motor learning and the consolidation of new skills. Consistent repetition of the horse's three-dimensional movement and the activities carried out during the sessions helps the brain

and body to integrate and automate more efficient movement patterns (Ajzenman et al., 2013; Bass et al., 2009; Bunketorp-Käll et al., 2017; Du Plessis et al., 2019; Encheff et al., 2012; Gilboa & Helmer, 2020; Helmer et al., 2024; Holm et al., 2014; Jeon & Son, 2021; T. L. Shurtleff et al., 2009). On the other hand, the length of the sessions is also a crucial factor. Longer sessions offer more time for practice and allow the client to explore a variety of movements and activities that promote occupational performance (Ajzenman et al., 2013; Berardi et al., 2022; Encheff et al., 2012; Gilboa & Helmer, 2020; Helmer et al., 2024; Holm et al., 2014; Llambias et al., 2016; Peters et al., 2020; T. Shurtleff & Engsberg, 2012; T. L. Shurtleff et al., 2009; Weissman-Miller et al., 2017). In this line of thinking, the longer the overall duration of the intervention (the number of weeks or months of treatment), the greater the chances of improvements being observed in the various contexts. Long-term hippotherapy treatment, with frequent and consistent sessions, favors sensory-motor, cognitive and socio-emotional experiences that have a significant impact on clients' occupational performance (Ajzenman et al., 2013; Berardi et al., 2022; Encheff et al., 2012; Gilboa & Helmer, 2020; Helmer et al., 2024; Holm et al., 2014; Llambias et al., 2016; Peters et al., 2020; T. Shurtleff & Engsberg, 2012; T. L. Shurtleff et al., 2009; Weissman-Miller et al., 2017).

In addition to the limited literature on occupational therapy and hippotherapy, the restricted access to certain literature limiting the present study, as well as some factors such as funding costs, difficulties in measuring results, maintaining intervention duration, and small sample sizes are highlighted by some authors as limitations (Ajzenman et al., 2013; Angoules et al., 2015; Bass et al., 2009; Berardi et al., 2022; Cotton, 2021; Helmer et al., 2024; Holm et al., 2014; Jeon & Son, 2021; Johnson et al., 2018; Nelson et al., 2022; Shotwell et al., 2017). These factors indicate the need for further research, specialized training, adequate funding, and the development of strategies to overcome barriers to the use of hippotherapy in occupational therapy practice. On the other hand, the benefits of the present scoping review include the identification of gaps, the synthesis of evidence, support for clinical practice, and the foundation for recommendations and guidelines, as these contributions are essential for advancing knowledge, improving clinical practice, and guiding future research in the field of occupational therapy and hippotherapy (AHA, 2021).

Regarding the lack of studies in other languages, such as Portuguese, it's important to consider that English is widely recognized as the dominant language in scientific communication, especially in international databases. Thus, many researchers, even from Portuguese-speaking

countries, choose to publish in English in order to reach a global audience, which may explain the lack of articles in Portuguese, considering that there is a low number of articles produced on this specific area by Portuguese authors (Jonkers et al. 2016).

Compared to other reviews that specify the study to a pathology or condition (Angoules et al., 2015; Araújo et al., 2020) or a review that didn't focus on a specific area of intervention (OT, PT, and/or SLP) (Wood et al., 2021), the present scoping review is notable for its specificity in mapping and synthesizing the intervention of OTs who use HPOT as a treatment tool for transdiagnostic individuals. Thus, it allows us to identify effective interventions or strategies that can be applied to different diagnoses, broadening practical applicability for professionals and strengthening the evidence base in OT. At the same time, it allows us to verify the uniqueness of evidence-based practice and the impact of an intervention following the guidelines of the occupational therapy practice framework: domain and process 4th edition, not discussed in other studies (AOTA, 2020).

In this way, this study has implications for practice, as it highlights widely applicable strategies or approaches, allowing professionals to integrate them into clinical practice to improve outcomes. In addition, it facilitates clinical decisions by identifying interventions that meet the needs of specific populations, even in complex or transdiagnostic contexts, reinforcing person-centered approaches. These implications strengthen the impact of the review, connecting theory to practice and pointing to clear directions for scientific and professional advancement.

Conclusion

The purpose of this scoping review is to analyze, synthesize, and map the current state of existing knowledge regarding interventions implemented and proposed by occupational therapists utilizing hippotherapy as a treatment tool for individuals with transdiagnostic conditions.

The results showed that, regardless of the diagnosis and age group of the participants, occupational therapy sessions, that use hippotherapy as a treatment tool, follow an assessment with standardized and non-standardized instruments, as well as instruments adapted and validated for the hippotherapy context. Regarding the approaches used, OTs prefer the therapeutic use of occupations and activities, the educational process and group intervention, using various activities on the ground and on horseback for the acquisition, development and maintenance of performance skills that impact occupational performance.

These results reinforce the importance and add value of HPOT as an OT treatment tool, impacting positively on the occupational performance, participation and quality of life of the participants, regardless of diagnosis and age group.

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