

# **Hippotherapy concepts: A scoping review to inform transdisciplinary practice guidelines**

Running headline: Transdisciplinary hippotherapy concepts

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## Biographical notes

Ninette du Plessis is an occupational therapist and PhD student. Her special interest is to improve participation in all areas of life using hippotherapy as treatment tool for clients with multiple disabilities. Working in multidisciplinary teams in different countries and presenting hippotherapy course modules on hippotherapy courses led to the aspiration of contributing to the scientific development of hippotherapy.

Kitty Uys is an occupational therapist. Her research focus is on the outcomes that accommodation and adaptation are providing individuals with severe and multiple disabilities to participate in their occupations. Working with families of people with disabilities led to the realisation of gaps in the education and health care systems that hinders sustainable rehabilitation. Therefore, transdisciplinary training and interprofessional education and practice inform her teaching pedagogy. She is currently the head of the Department of Occupational Therapy at the University of Pretoria.

## **Abstract**

**Background:** Hippotherapy, an equine-assisted service, uses the movement of the horse as a treatment tool. Hippotherapy is often used by occupational therapists, physiotherapists, and speech and language pathologists. To optimise hippotherapy and facilitate the development of transdisciplinary hippotherapy practise guidelines, this scoping review identified novel hippotherapy concepts used during hippotherapy interventions for clients with spastic cerebral palsy.

**Aim:** To explore, identify, and describe concepts that constitute hippotherapy practices for clients with spastic cerebral palsy.

**Methods:** An exploratory descriptive qualitative research design, using Arksey and O'Malley's five stages of scoping review.

**Results:** We identified and tabulated 19 hippotherapy concepts.

**Conclusions:** Hippotherapy is a complex intervention with multiple concepts. This review contributed to the develop of hippotherapy practice guidelines for clients with spastic cerebral palsy.

**Significance:** Including hippotherapy concepts into hippotherapy practice will inform therapists, benefit clients, and contribute to future research.

**Keywords:** Animal-assisted therapy, components, equine-assisted therapy, equine therapy, occupational therapy, physiotherapy, speech and language pathologists, therapy tool, elements.

## **Introduction**

In this article we use the term ‘hippotherapy’ for therapy that uses the movement of a horse [1-3] to treat functional limitations in clients with neuro-motor or sensory difficulties [3-5]. Hippotherapy is often used by occupational therapists (OTs), physiotherapists (PTs), and speech and language pathologists (SLPs) [1,2].

Research on hippotherapy mainly focuses on various outcomes [2,4-6] mostly in the cerebral palsy (CP) population [2,4,7,8]. This focus on outcomes is expected during the early phases of scientific development of any intervention [2,9]. These early hippotherapy studies often lack conceptual details and do not describe how concepts are applied [2,5,10]. In this scoping review, the term ‘concepts’ refers to abstract ideas and physical components that emerge in descriptions of interventions to treat clients who are mounted on a moving horse. In their comprehensive mapping review, Wood and Fields [2] confirmed that hippotherapy studies often lacked a conceptual foundation and suggested that hippotherapy concepts should be formulated and explained. They also found widespread differences in how hippotherapy was implemented [2].

Recently, we identified a need to develop hippotherapy practice guidelines. The World Health Organisation has stated that guidelines increase clarity in a field by outlining the specifics of an intervention, guiding implementation, and providing supporting data. However, before we could develop guidelines, we needed to identify and describe hippotherapy concepts, which was the aim of this scoping review.

Currently, few articles have described hippotherapy concepts, and many of these articles are difficult to obtain. Furthermore, the terminology used for equine-assisted services is still debated and refined across countries [11]. We therefore decided to conduct a conceptual analysis using a scoping review methodology [12]. The aim of this paper was to identify and describe concepts in hippotherapy practices for clients with spastic CP.

The study was approved by the Faculty of Health Sciences Research Ethics Committee of the University of Pretoria in South Africa, ethics reference number: 774/2019.

## **Material and methods**

### ***(1) Design***

This was an exploratory descriptive qualitative study, to identify, describe, and explore concepts in hippotherapy. We followed five steps from Arksey and O'Malley's scoping review methodology [13].

#### *Step 1: Identify the research question*

The research question was: Which concepts emerge from the selected literature on hippotherapy practices for clients with cerebral palsy?

#### *Step 2: Identify the relevant studies*

The field of hippotherapy research is still developing [2]. To gain a comprehensive view of the field, we searched for both peer reviewed literature and grey literature published from 2009 to 2019. Grey literature included Doctoral and Masters Theses, and course notes from the Equine Assisted Therapy Association of South Africa (EATASA). We searched the databases: EBSCOhost, PubMed, and ProQuest (Social science, dissertations, and thesis global). Searches used the keywords: 'hippotherapy', 'cerebral palsy', and 'treatment or intervention or therapy'. The process (Figure 1) yielded 123 unique documents that were exported to Endnote.

#### *Step 3: Selection of documents*

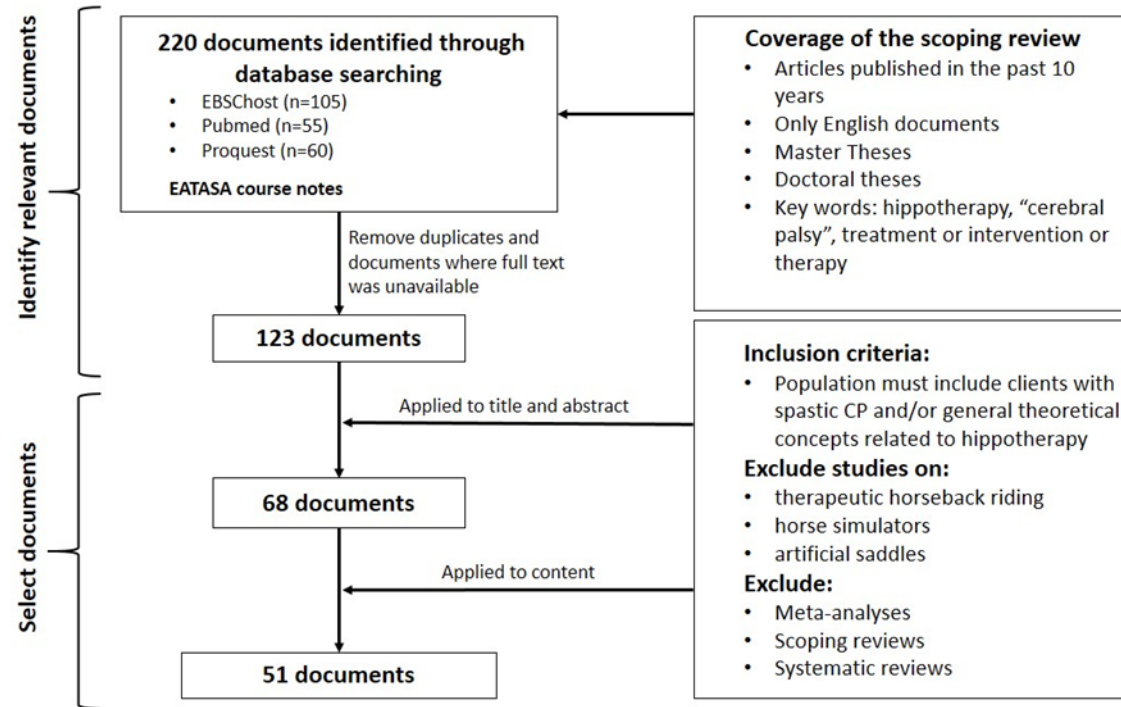


Figure 1: Process followed to identify and select documents in this scoping review on hippotherapy interventions for patients with cerebral palsy.

Documents were screened according to following criteria:

Inclusion criteria:

- only English documents
- studies focussing on a CP population
- studies describing general or theoretical hippotherapy concepts

Exclusion criteria:

- therapeutic horseback riding
- horse simulators or artificial saddles
- meta-analyses, scoping reviews, and systematic reviews

The inclusion and exclusion criteria were applied to the titles, abstracts, and content of 123 retrieved documents, leaving 51 documents to be reviewed. Table 1 list these documents and the all the data bases where each article was found (including duplicates).

#### *Step 4: Charting the data*

We extracted data into a data charting form using Microsoft Excel. The selected 51 documents were reviewed alphabetically according to the first author's surname. All hippotherapy concepts were charted in the data charting form as column headings. We reached concept saturation after reviewing the 11<sup>th</sup> document. We did not identify any new concepts after reviewing the 11<sup>th</sup> document, and we thus restricted our search to studies conducted between 2009 and 2019. We would have expanded our search beyond 2009 if we had not reached concept saturation.

Table 1: Search protocol

1 <sup>st</sup> Author (Year)	Data base	Title of study
Antunes (2016) [14]	EBSChost Pubmed ProQuest	Different horse's paces during hippotherapy on spatio-temporal parameters of gait in children with bilateral spastic cerebral palsy: A feasibility study
Champagne (2017) [10]	EBSChost Pubmed	Effect of hippotherapy on motor proficiency and function in children with cerebral palsy who walk
Debuse (2009) [15]	EBSChost Pubmed	Effects of hippotherapy on people with cerebral palsy from the users' perspective: a qualitative study
Del Rosario-Montejo (2015) [16]	EBSChost Pubmed ProQuest	Effectiveness of equine therapy in children with psychomotor impairment
Deutz (2018) [17]	EBSChost Pubmed ProQuest	Impact of hippotherapy on Gross Motor Function and Quality of Life in children with bilateral cerebral palsy: A randomized open-label crossover study
Doherty (2017) [18]	ProQuest	The effectiveness of a six week hippotherapy intervention for children with varied developmental disabilities
Du Plessis (2019) [19]	EBSChost ProQuest	The effect of hippotherapy on physiological cost index and walking speed of adolescents with diplegia
Dziuba (2013) [20]	EBSChost	Thermovision techniques for evaluation of the effect of hippotherapy on changes in lower limb temperature in children with cerebral palsy (CP) – a pilot study
EATASA (2019) [1]	Personal correspondence	Course notes
Ei-Meniawy (2012) [21]	EBSChost ProQuest	Modulation of back geometry in children with spastic diplegic cerebral palsy via hippotherapy training
Fizkova (2013) [22]	EBSChost	The effect of hippotherapy on gait in patients with spastic cerebral palsy
Flores (2019) [23]	EBSChost Pubmed	Do the type of walking surface and the horse speed during hippotherapy modify the dynamics of sitting postural control in children with cerebral palsy?
Grockienė (2018) [24]	EBSChost	Influence on functional mobility and motivation of hippotherapy for people with special needs
Honkavaara (2010) [25]	EBSChost	The influence of short term, intensive hippotherapy on gait in children with cerebral palsy

Hsieh (2017) [26]	EBShost Pubmed	Effects of hippotherapy on body functions, activities and participation in children with cerebral palsy based on ICF-CY assessments
Jakubowska (2019) [27]	EBShost	The interdisciplinary and innovativeness of methods in rehabilitation of children with cerebral palsy
Kelly (2015) [28]	ProQuest	How hippotherapy benefits individuals with cerebral palsy
Koca (2016) [29]	EBShost	What is hippotherapy? The indications and effectiveness of hippotherapy.
Krejčí (2015) [30]	EBShost	The benefit of hippotherapy for improvement of attention and memory in children with cerebral palsy: A pilot study
Kwon (2015) [31]	EBShost Pubmed ProQuest	Effect of hippotherapy on gross motor function in children with cerebral palsy: a randomized controlled trial
Kwon (2011) [32]	EBShost Pubmed	Effects of hippotherapy on gait parameters in children with bilateral spastic cerebral palsy
Lacey (2018) [33]	EBShost ProQuest	The effects of hippotherapy on the gross motor functional abilities of children with cerebral palsy using clinical outcome measures and parent/guardian reported outcomes
Lakomy-Gawryszewsk (2017) [34]	EBShost	The impact of hippotherapy on the quality of trunk stabilisation, evaluated by EMG biofeedback, in children with infantile cerebral palsy
Lipińska-Stańczak (2014) [35]	EBShost	Hippotherapy as a form of physiotherapy support in children with cerebral palsy in the opinion of parents.
Lucena-Anton (2018) [36]	EBShost Pubmed ProQuest	Effects of a hippotherapy intervention on muscle spasticity in children with cerebral palsy: a randomized controlled trial.
Maćków (2014) [37]	EBShost Pubmed	Influence of neurophysiological hippotherapy on the transference of the centre of gravity among children with cerebral palsy
Manikowska (2013) [38]	EBShost Pubmed ProQuest	The effect of a hippotherapy session on spatiotemporal parameters of gait in children with cerebral palsy - pilot study
Matusiak-Wieczorek (2016) [39]	EBShost Pubmed ProQuest	Influence of hippotherapy on body balance in the sitting position among children with cerebral palsy
McGee (2009) [40]	EBShost Pubmed	Immediate effects of a hippotherapy session on gait parameters in children with spastic cerebral palsy
McGibbon (2009) [41]	EBShost Pubmed	Immediate and long-term effects of hippotherapy on symmetry of adductor muscle activity and functional ability in children with spastic cerebral palsy



Moraes (2018) [42]	EBShost Pubmed ProQuest	Hippotherapy on postural balance in the sitting position of children with cerebral palsy - Longitudinal study
Mutoh (2019) [43]	EBShost Pubmed	Effect of hippotherapy on gait symmetry in children with cerebral palsy: A pilot study
Mutoh (2019) [44]	EBShost Pubmed	Impact of long-term hippotherapy on the walking ability of children with cerebral Palsy and quality of life of their caregivers
Mutoh (2018) [45]	EBShost Pubmed ProQuest	Impact of serial gait analyses on long-term outcome of hippotherapy in children and adolescents with cerebral palsy
Mutoh (2016) [46]	EBShost Pubmed	Application of a tri-axial accelerometry-based portable motion recorder for the quantitative assessment of hippotherapy in children and adolescents with cerebral palsy
O'Mahony (2019) [47]	EBShost	A qualitative study of Irish parents' views on hippotherapy, including its influence on their children's home-based occupations
Park (2014) [48]	EBShost	Effects of hippotherapy on gross motor function and functional performance of children with cerebral palsy
Reubens (2016) [49]	EBShost Pubmed	Intervention for an adolescent with cerebral palsy during period of accelerated
Ribeiro (2019) [50]	EBShost Pubmed ProQuest	Analysis of the electromyographic activity of lower limb and motor function in hippotherapy practitioners with cerebral palsy
Rigby (2017) [51]	EBShost Pubmed ProQuest	Changes in cardiorespiratory responses and kinematics with hippotherapy in youth with and without cerebral palsy
Rigby (2014) [52]	ProQuest	Changes in cardiorespiratory responses and pelvic kinematics with hippotherapy in youth with and without cerebral palsy
Romsha (2015) [53]	EBShost	Effect of hippo therapy on balance and function in children with spastic diplegia
Seung Mi (2019) [54]	EBShost Pubmed ProQuest	Factors influencing motor outcome of hippotherapy in children with cerebral palsy
Shurtleff (2012) [55]	EBShost ProQuest	Long-term effects of hippotherapy on one child with cerebral palsy: a research case
Shurtleff (2010) [56]	EBShost Pubmed	Changes in trunk and head stability in children with cerebral palsy after hippotherapy: A pilot study

Shurtleff (2009) [57]	EBSChost Pubmed	Changes in dynamic trunk/head stability and functional reach after hippotherapy
Silkwood-Sherer (2012) [58]	EBSChost Pubmed ProQuest	Hippotherapy-an intervention to habilitate balance deficits in children with movement disorders: a clinical trial
Stevens (2018) [59]	EBSChost ProQuest	The effect of intensive physical therapy with hippotherapy in paediatric cerebral palsy
Sunwoo (2012) [7]	EBSChost Pubmed ProQuest	Hippotherapy in adult patients with chronic brain disorders: a pilot study
Wolff (2018) [8]	ProQuest	The effect of hippotherapy on seated trunk stability
Yokoyama (2013) [60]	EBSChost	Hippotherapy to improve hypertonia caused by an autonomic imbalance in children with spastic cerebral palsy

Details from the 51 documents included in this scoping review are summarised in Table 2.

*Step 5: Collating summarising and reporting the results*

The charted hippotherapy concepts were thematically analysed and collated using deductive reasoning. A concrete pragmatic approach was followed that led to 19 hippotherapy concepts. For example, the ‘height of the horse’, ‘the width of the horse’ and ‘the weight of the horse’ were collated to ‘the size of the horse’, but “temperature” was left as a separate heading and not included under the heading “physical environment” as it referred to both the environmental temperature and the temperature provided by the horse.

***(2) Rigor***

In this scoping review, we paid careful attention to the detail or rigor of every step. We kept an audit trail in an honest and sincere way to ensure trustworthiness [61,62]. These documents will be securely stored for 15 years at the occupational therapy department of the University of Pretoria.

The research team was involved from the start to end of this scoping review, showing prolonged engagement. The research team met regularly, increasing the credibility of the scoping review. We adhered to and recorded every one of the five steps of Arksey and O’Malley [13], subsequently establishing dependability.

We repeated the selection of documents (step 3) twice, and we followed this up with a team meeting to verify inclusion or exclusion of documents.

During data charting (step 4), collating, and summarising charted data (step 5), we held face-to-face meetings to discuss the process and results. In these meetings, we defined and documented the hippotherapy concepts identified from the literature.

Table 2: Hippotherapy concepts identified

1st Author (Year)	Title of study	Service provider	Human team members	Horse temperament	Horse breed	Horse size	Horse movement	Ground courses	Positioning of the client	Theoretical explanations	Treatment goals	Precautions	Activity characteristics	Dosage	Physical handling	Manner of leading	Physical environment	Temperature	Therapy equipment	Horse tack
Antunes (2016) [14]	Different horse's paces during hippotherapy on spatio-temporal parameters of gait in children with bilateral spastic cerebral palsy: A feasibility study	X	X				X			X			X	X	X				X	X
Champagne (2017) [10]	Effect of hippotherapy on motor proficiency and function in children with cerebral palsy who walk	X	X						X	X	X		X	X	X	X	X		X	X
Debuse (2009) [15]	Effects of hippotherapy on people with cerebral palsy from the users' perspective: a qualitative study	X	X				X			X				X						
Del Rosario-Montejo (2015) [16]	Effectiveness of equine therapy in children with psychomotor impairment	X							X	X			X	X						X
Deutz (2018) [17]	Impact of hippotherapy on gross motor function and quality of life in children with bilateral cerebral palsy: A randomized open-label crossover study	X	X							X				X			X			
Doherty (2017) [18]	The effectiveness of a six week hippotherapy intervention for children with varied developmental disabilities	X	X	X		X	X		X	X	X		X	X	X				X	X
Du Plessis (2019) [19]	The effect of hippotherapy on physiological cost index and walking speed of adolescents with diplegia	X	X			X	X			X		X	X	X						
Dziuba (2013) [20]	Thermovision techniques for evaluation of the effect of hippotherapy on changes in lower limb temperature in children with cerebral palsy (CP) – a pilot study					X				X		X		X			X	X		
EATASA (2019) [1]	Course notes	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X		X	X
El-Meniawy (2012) [21]	Modulation of back geometry in children with spastic diplegic cerebral palsy via hippotherapy training	X					X	X		X	X		X	X		X			X	X
Fizkova (2013) [22]	The effect of hippotherapy on gait in patients with spastic cerebral palsy	X	X		X		X	X	X	X				X	X					

Flores (2019) [23]	Do the type of walking surface and the horse speed during hippotherapy modify the dynamics of sitting postural control in children with cerebral palsy?		X			X	X		X	X			X	X	X		X			X
Grockienė (2018) [24]	Influence on functional mobility and motivation of hippotherapy for people with special needs	X	X	X			X		X	X	X		X				X	X		
Honkavaara (2010) [25]	The influence of short term, intensive hippotherapy on gait in children with cerebral palsy	X	X						X	X	X	X	X		X				X	X
Hsieh (2017) [26]	Effects of hippotherapy on body functions, activities and participation in children with cerebral palsy based on ICF-CY assessments	X	X	X		X	X	X	X	X		X	X	X	X					X
Jakubowska (2019) [27]	The interdisciplinary and innovativeness of methods in rehabilitation of children with cerebral palsy	X		X			X		X			X					X			
Kelly (2015) [28]	How hippotherapy benefits individuals with cerebral palsy	X	X					X	X	X		X		X			X			
Koca (2016) [29]	What is hippotherapy? The indications and effectiveness of hippotherapy	X	X				X		X	X		X								
Krejčí (2015) [30]	The benefit of hippotherapy for improvement of attention and memory in children with cerebral palsy: A pilot study	X							X				X							
Kwon (2015) [31]	Effect of hippotherapy on gross motor function in children with cerebral palsy: a randomized controlled trial	X	X			X	X		X		X	X	X			X		X	X	X
Kwon (2011) [32]	Effects of hippotherapy on gait parameters in children with bilateral spastic cerebral palsy	X	X			X			X		X	X	X			X		X	X	X
Lacey (2018) [33]	The effects of hippotherapy on the gross motor functional abilities of children with cerebral palsy using clinical outcome measures and parent/guardian reported outcomes	X	X				X		X	X	X		X				X			
Lakomy-Gawryszewsk (2017) [34]	The impact of hippotherapy on the quality of trunk stabilisation, evaluated by EMG biofeedback, in children with infantile cerebral palsy	X							X	X			X							
Lipińska-Stańczak (2014) [35]	Hippotherapy as a form of physiotherapy support in children with cerebral palsy in the opinion of parents	X					X		X	X	X		X							
Lucena-Anton (2018) [36]	Effects of a hippotherapy intervention on muscle spasticity in children with cerebral palsy: a randomized controlled	X	X				X		X			X	X	X	X	X	X			X

	trial																			
Maćków (2014) [37]	Influence of neurophysiological hippotherapy on the transference of the centre of gravity among children with cerebral palsy	X	X			X	X	X	X	X	X		X	X	X					
Manikowska (2013) [38]	The effect of a hippotherapy session on spatiotemporal parameters of gait in children with cerebral palsy - pilot study	X					X		X	X	X			X						
Matusiak-Wieczorek (2016) [39]	Influence of hippotherapy on body balance in the sitting position among children with cerebral palsy	X	X							X			X	X	X	X	X			
McGee (2009) [40]	Immediate effects of a hippotherapy session on gait parameters in children with spastic cerebral palsy	X							X	X		X	X	X				X		
McGibbon (2009) [41]	Immediate and long-term effects of hippotherapy on symmetry of adductor muscle activity and functional ability in children with spastic cerebral palsy	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X		X	X
Moraes (2018) [42]	Hippotherapy on postural balance in the sitting position of children with cerebral palsy - Longitudinal study	X	X			X	X	X	X	X		X	X	X	X	X	X			X
Mutoh (2019) [43]	Effect of hippotherapy on gait symmetry in children with cerebral palsy: A pilot study	X			X								X	X			X			
Mutoh (2019) [44]	Impact of long-term hippotherapy on the walking ability of children with cerebral palsy and quality of life of their caregivers	X				X	X			X			X	X			X			
Mutoh (2018) [45]	Impact of serial gait analyses on long-term outcome of hippotherapy in children and adolescents with cerebral palsy	X	X	X	X	X	X	X	X	X	X		X	X	X		X		X	
Mutoh (2016) [46]	Application of a tri-axial accelerometry-based portable motion recorder for the quantitative assessment of hippotherapy in children and adolescents with cerebral palsy	X	X				X	X		X			X	X	X	X	X		X	X
O'Mahony (2019) [47]	A qualitative study of Irish parents' views on hippotherapy, including its influence on their children's home-based occupations	X								X	X		X							
Park (2014) [48]	Effects of hippotherapy on gross motor function and functional performance of children with cerebral palsy	X	X						X	X	X		X	X				X	X	
Reubens (2016) [49]	Intervention for an adolescent with cerebral palsy during period of accelerated	X	X			X	X		X	X	X		X	X	X	X	X		X	X

Ribeiro (2019) [50]	Analysis of the electromyographic activity of lower limb and motor function in hippotherapy practitioners with cerebral palsy			X	X	X	X		X	X		X	X	X			X		X	X
Rigby (2017) [51]	Changes in cardiorespiratory responses and kinematics with hippotherapy in youth with and without cerebral palsy	X	X				X		X	X			X	X						X
Rigby (2014) [52]	Changes in cardiorespiratory responses and pelvic kinematics with hippotherapy in youth with and without cerebral palsy	X	X						X	X	X	X	X	X			X			X
Romsha (2015) [53]	Effect of hippo therapy on balance and function in children with spastic diplegia	X					X		X				X				X			
Seung Mi (2019) [54]	Factors influencing motor outcome of hippotherapy in children with cerebral palsy	X	X			X			X				X	X	X		X	X	X	X
Shurtleff (2012) [55]	Long-term effects of hippotherapy on one child with cerebral palsy: a research case	X	X				X	X	X	X			X	X		X	X			X
Shurtleff (2010) [56]	Changes in trunk and head stability in children with cerebral palsy after hippotherapy: A pilot study	X	X			X	X	X	X	X		X	X	X		X	X			
Shurtleff (2009) [57]	Changes in dynamic trunk/head stability and functional reach after hippotherapy	X	X	X		X	X	X	X	X			X	X						
Silkwood-Sherer (2012) [58]	Hippotherapy-an intervention to habilitate balance deficits in children with movement disorders: A clinical trial	X	X						X				X	X					X	X
Stevens (2018) [59]	The effect of intensive physical therapy with hippotherapy in pediatric cerebral palsy.	X	X				X		X	X	X		X	X	X					X
Sunwoo (2012) [7]	Hippotherapy in adult patients with chronic brain disorders: A pilot study	X	X		X		X		X	X	X		X	X	X	X	X		X	
Wolff (2018) [8]	The effect of hippotherapy on seated trunk stability	X	X						X	X			X	X						
Yokoyama (2013) [60]	Hippotherapy to improve hypertonia caused by an autonomic imbalance in children with spastic cerebral palsy	X	X		X	X	X	X		X			X	X						X

## Results

The emerging hippotherapy concepts are presented in Table 2. We identified 19 concepts from the literature.

### (1) Hippotherapy providers

Forty-eight documents (94%) indicated who provided or should provide hippotherapy, namely PTs (n=36) [1,7,8,14,15,17,18,21,22,24-33,35,36,38,41,42,47-49,51-57,59,60], OTs (n=22) [1,8,10,14,18,19,21,28-30,33,44,47-49,51-57] and SLPs (n=14) [1,8,14,18,28-30,33,47,49,51-53,55]. Twenty documents mentioned more than one therapy professional. The term ‘therapist’ was used in four documents without specifying any speciality [37,39,40,43]. Other professions mentioned as service providers were: ‘professionals’ [16,33,40] ‘OT assistants’ [56,57], ‘hippotherapist’ [34,37,39], ‘therapeutic riding instructors’ [16,33,44-46], ‘equine therapy specialist’ [38], ‘the primary investigator’ [58], ‘psychologist’ [18,44] ‘a physician’ [35,44], ‘educator’ [22], and ‘allied health student interns’ [33].

Twenty eight (55%) documents mentioned that the provider should be experienced or trained, licenced certified or registered, suggesting a professional status and extra training without expanding on the required qualifications [1,7,8,10,16-19,25,26,31,33,36,38,40,41,44-49,51,52,54,56,57,60].

### (3) Human team members

Besides hippotherapy providers, 35 documents (69%) mentioned other human team members. Thirteen documents (25%) mentioned that these team members should be trained [1,10,31,32,36,45,55,57], qualified [39] and experienced [23,31,32,36,42,49,56-58].



In 27 documents (53%), a therapist instructed a person who directed or lead the horse, also called a ‘horse handler’ [10,15,17,19,26,28,41,42,49,55,58-60], ‘horse leader’ [1,7,22,31,36,56,57], ‘guide’ [23] or ‘assistant’ [45,46,48].

Clients were supported or assisted by a person other than the therapist in 28 documents (53%). A person who walked beside the horse was called a ‘side walker’ [1,7,8,10,14,18,19,24,28,32,36,42,49,54-57,59], a ‘lateral assistant’ [23] or ‘volunteer’ [48,51,52]. One study mentioned that the role of the side walker is to walk beside the horse, with the therapist walking on the opposite side, giving the needed support or facilitation [18]. Five documents mentioned two side walkers [7,10,28,31,45,46] in a session.

Several studies mentioned other team members without describing their role or function. These team members included ‘horse carer’ [29], ‘horse expert’ [24], ‘horse trainer’ [32], ‘therapeutic riding instructor’ [29], ‘assistant’ [39,41], and ‘auxiliary support staff’ [33], but they did not describe the function of these mentioned team members.

#### (4) Horse temperament

Six documents mentioned the importance of horse temperament and used words such as ‘quiet’ [1], ‘steady’ [1], ‘non-aggressive’ [24], ‘social’ [24], ‘docile’ [50] and ‘never skittish’ [27]. Horses should have an ‘exemplary’ [26,41], ‘mild’ [27], ‘placid’ [27] or ‘proper’ [27] temperament. These words were not defined or described in the documents. The EATASA course notes [1] further stated that therapy horses should excel in ground manners, have an exceptional temperament, and be psychologically ready to do therapy. Three documents mentioned the importance of horse temperament when matching horses with clients [18,45,57].

#### (5) Horse breed

No document stated what horse breed should be used in hippotherapy. Yet, six documents [7,22,43,45,50,60] mentioned 12 different breeds used within their specific studies.

(6) Horse size

Horse size was described in accordance to height, width and weight of the horse, but not all studies gave all these measurements. Horse height varied between 135cm to 162cm at the withers of the horse [23,31,32,42,50,54,60]. One document mentioned that the horse should have a 'wide trunk' [37] and another specified the measures of the 'horse's barrel' [49]. Horse mass varied between 294 kg and 530 kg [31,32,42,54,60]. Twelve documents (24%) mentioned that the size of the horse played a role in matching the client to the horse [1,18,19,26,31,32,41,44,45,54,56,57], but did not mention any specific reasons.

(7) Horse movement

Eleven documents mentioned that horse movement played a role when selecting and matching a horse to a client [1,18,19,22,28,31,44,45,51,52,56]. Only the EATASA course notes [1], described the movement assessment and matching process. Some documents stated that horse movement could be 'altered' [19], 'directed' [33,49], 'adjusted' [37], 'changed' [39], 'modified' [21,41], 'manipulated' [14,23], 'varied' [15] or 'graded' [1,29] by the therapist to achieve therapeutic goals. Most studies mentioned which horse gaits were used [7,14,18,21,22,26,35-38,41,42,45,46,50,53,55-57,59,60] and the effect of the gait on the client [1,18,29,33,49].

Specific aspects of horse movement that were mentioned were: 'soundness' [1,26], 'stride length' or 'step length' [1,26,52], 'free rhythmic movement' [1,26,41,55], and that 'the horse must be capable of different gaits' [1].

(8) Ground courses in which the horse is directed to walk

The influence of the planned route or ‘designated track’ [26,41] are discussed in the EATASA course notes [1] and mentioned in three other documents [41,55,57].

Other documents mentioned various combinations of ground courses used such as ‘straight lines’ [1,41,42,55-57], ‘gentle curves’ [1,41,42], ‘large and small circles (both clock wise and counter clockwise)’ [1,37,41,55-57,60], ‘winding rides (serpentine)’ [1,41,45,46,55], ‘walking on uneven terrain’ [22,41,57], ‘incline and declines’ [22,42], ‘zigzags with wide and tight angled turns’ [1,42,45,46,55-57], ‘figure-eights’ [1,22,55,56] and ‘walking in a rectangular shape around the treatment arena’ [21,45,46].

#### (9) Positioning of the client

Twenty-seven documents (53%) described how the client was positioned on the horse. The most common positions are illustrated in Figure 2. Other positions that were mentioned included ‘prone on forearms’ [10], placing feet in stirrups [23,50], ‘standing in stirrups’ [10], tall kneel [49,55-57], half kneel [49] and the placement of the client’s arms [23] while on a moving horse.

In some documents, clients were asked to transition between positions [18,41,55-57], including taking up various vaulting positions [18].

Only one document gave a reason for positioning, stating that leaning forward while seated, or embracing the horse around the neck provided different sensory input [35]. Another document cautioned that an exaggerated reaction to change in position will lead to increased postural tone, resulting in inadequate postural adjustments and abnormal movement patterns [36].

#### (10) Theoretical explanations of benefits

Thirty one documents (61%) stated that the horse’s movement had an effect on the client’s pelvis by simulating human ambulation or facilitating adaptive responses. This ambulation and responses were instrumental in reaching therapeutic goals [1,7,10,14-16,18-25,27-29,31-

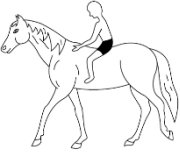
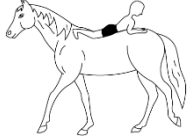
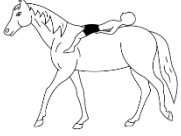
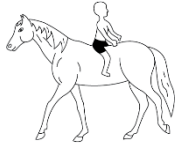
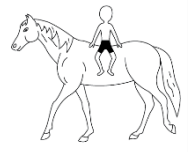
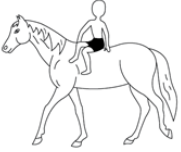
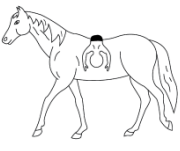
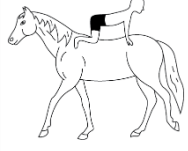
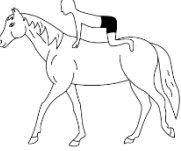
<p>Forwards sitting astride [1,7,8,10,16,22,26,28,35,37,38,40-42,45,48,55-57,59]</p>	<p>Backward prone [1,8,22,42,51,52]</p>	<p>Backwards supine [1,8,42,51,52]</p>
		
<p>Backwards sitting [1,7,8,10,18,41,42,51,52,55-57,59]</p>	<p>Side sitting [1,7,8,10,28,41,42,51,52,55-57,59]</p>	<p>Modified side sitting [1,8,41]</p>
		
<p>Prone lying "over the barrel" [1,10,22,51,52]</p>	<p>On all fours backwards [1,7,10,49,55-57]</p>	<p>On all fours forwards [1,7,10,49,55-57]</p>
		

Figure 2: Positioning of the client on the horse.

35,37-40,51-54,59]. Some documents described the sensory benefits of hippotherapy [7,8,18,22,25,29,37,41,55-57]. Other documents mentioned that hippotherapy influences neuro-muscular [26,49] or neurophysiological development [20,25,34,37,38], stimulates postural reflex mechanisms [30,50] or that various systems are involved [29,42,47-49,54,57].

Several documents mentioned theoretical models, including dynamic systems theory [1,28], the Occupational Functional Model [1], Sensory Integration [19,28,46], theory of neuronal group selection [28] neuro-physiological principles [19,20,25,34] and Neuro Developmental Treatment [1,19] to explain why the movement of the horse improved various bodily functions.

Hippotherapy positively influenced motivation [26,45], improve mood [17,27,49,59], concentration [8,27], confidence, [30] self-esteem [30] and quality of life [17,59] due to psychosocial interactions between the horse and the client.

#### (11) Treatment goals

The documents mentioned many different treatment goals. Three documents suggested that therapists should collaborate with clients and their families to set functional treatment goals [1,18,59]. We described treatment goals using the terminology set out by the International Classification of Functioning, Disability and Health (ICF).

The most common goals were to improve neuromusculoskeletal and movement-related function (n=18) [1,7,18,21,24,25,28,29,33-35,37,38,41,45,49,52,59], sensory function (n=9) [1,7,18,21,29,33,45,48,52] and mental function (n=8) [7,18,29,41,45,48,49,52]. Two papers mentioned voice and speech function [1,25], and cardiovascular function [1,29]. One document aimed to improve digestive system (masticatory) function [29]. The EATASA course notes [1] further explain how the movement of the horse can improve different bodily functions and encourage therapists to apply professional reasoning to achieve treatment goals.

Goals regarding activities and participation were mostly linked to mobility (n=13) [7,10,18,21,24,25,29,33,38,41,45,49,59], two to communication [1,18] and two to interpersonal relationships [35,47]. One document mentioned disability, mentioning that for diplegic clients, hippotherapy can prevent deformities [21].

#### (12) Precautions

Fifteen documents (29%) hinted at precautions, mentioning several considerations. Other than the EATASA course notes [1], which described in-depth precautions, only two documents explicitly mentioned the word 'precautions' [19,24].

Documents mentioned safety precautions including external safety gear such as riding hats [24,31,32,50], footwear [24] and safety belts [25]. Documents also mentioned client specific considerations such as range of motion [20,42], weight [26,33], doctor referrals [33,41,50,56], physical endurance and fitness [40,42], heart rate [19], response to movement [36,42] and preparation before a session [52].

#### (13) Activity characteristics

Forty one of the documents (80%) described activities used during therapy. In some studies, these activities were selected to reach individualised treatment goals for each client (n=12).

Activity characteristics ranged in complexity, such as:

- simply sitting on a moving horse (n=21) [1,7,14,16,21,23,25-27,31,32,37,39,41,43-46,50,54,60]
- taking part in exercises (n=28) [1,8,10,18,21,25,27-29,31,32,35,36,39-45,48,51,52,54-57,59]

- sport related activities such as placing rings or containers on poles or hooks or reaching to grasp objects, or catching and throwing a ball, or hitting a target (n=9) [1,10,18,22,51,52,55-57]
- vaulting (gymnastics on a moving horse) and vaulting positions (n=3) [1,18,49]
- activities that included fine motor aspects such as putting/ taking out pegs/clips in the mane or putting stickers on the horse (n=2) [1,18]
- activities that introduce cognitive aspects (n=4) [1,18,56,57]
- activities that encourage interaction and communication with the horse, the instructors and other supporting staff, and talking about emotions (n=2) [1,18]

#### (14) Dosage

Dosage includes the duration of each session, frequency of sessions, and total number of sessions. Most documents reported some dosage information with considerable variation between studies. Most documents (n = 42) reported a duration between 15 minutes and one hour [10,16,18,25,33,36,40,44,48,51-53,55-60], with most of these documents (n = 25) reporting a session duration of 30 minutes [7,8,10,14,19-24,26,30-32,37-39,41-46,50,54]. The frequency of sessions varied from one session a week (n= 26) [10,15-19,21,26,30,33,36,38,39,41,43-47,50-52,55-57,59], two sessions per week (n=13) [7,17,31,32,34,38,42,44,48,49,53,54,58], daily sessions (n=3) [22,30,59] and even once off sessions [14,20,23,37,38,40,41,60]. The total number of sessions varied from one session (n=8) [14,20,23,37,38,40,41,60] to weekly sessions for two years [46,59]. Most documents reported a total of 12 sessions (n=9) [19,26,36,39,41,42,55-57] and eight sessions (n=8) [8,24,31,32,47,48,51,52].

(15) Physical handling of the client

During hippotherapy interventions, the therapist or side walker may physically handle the client to support or facilitate the movement of the client [1]. Ten documents (20%) mentioned, but did not describe the physical handling of the client [14,18,22,28,36,41,42,49,54,59], while nine documents (18%) mentioned the type of support given to clients when receiving hippotherapy. This ranged from stating that no support was given [23,45,46], while others added more detail such as hand placement [1,7,10,26,37,39]. Two documents mentioned special equipment to support the pelvis [1,14].

Four documents (8%) mentioned some kind of facilitation [37,39,42,49] and the EATASA course notes [1] described in-depth facilitation of the client.

(16) Manner of leading

Thirteen documents mentioned methods used to lead the horse (25%). Whenever a document mentioned that the horse was led (n = 11), we assumed that side leading was implied [1,7,10,36,39,41,42,46,49,55,56]. Long lining, where the horse is steered from behind on the ground with two lines, were mentioned in three documents [1,25,56]. Triangular leading, where the horse is led by one handler on each side was only mentioned once [1], as was the leading of the therapy horse from the back of another horse [21].

(17) Physical environment

Twenty four of the documents (47%) mentioned aspects of the physical environment such as:

- an indoor arena (n=10) [7,10,17,31,32,36,39,49,54,55]
- an outdoor arena (n=6) [10,20,43-45,49]
- an unspecified arena (n=2) [23,46]
- various kinds of flooring (n=7) [7,23,42,50,52,53]



- outdoor trails (n=3) [10,22,55]
- uneven terrain (n=1) [41]
- varied terrain (n=1) [56]
- mounting area (n=1) [1]
- accessibility (n=1) [1]

(18) Temperature

One document mentioned temperature in the arena, which was applicable to their outcome [20]. One document stated that in some geographical areas the winter months may be too cold for hippotherapy unless sessions are conducted in a heated arena [28]. Other documents reasoned that the horse's warmth could positively influence the client [20,24,27,33,40,48,54], such as improving muscle tone [63,64].

(19) Therapy equipment

Twenty-two documents (43%) described equipment, especially safety equipment. The EATASA course notes detailed the advantages and disadvantages of different safety equipment [1]. Sixteen documents mentioned a safety helmet, [1,7,10,18,21,24,31,32,41,45,46,48-50,54,58], some kind of safety belt for the client [10,18,21,49], and one mentioned footwear [24]. Eight documents mentioned a handle or strap for the client to hold onto [1,14,16,18,25,42,49,55]. Two documents mentioned special equipment for pelvic support of the clients [14,49]. The EATASA course notes also described ancillary equipment such as therapy wedges and rollers that may be used in horseback activities [1].

(20) Horse tack

Six documents (12%) mentioned tack for leading the horse such as a 'halter [10,49,58], lead chain' or 'lead rope' [1,10,18,49,58], 'a bridle' [1,23] or 'long reins' [1]. Two documents mentioned 'reins' either for leading the horse or for the client to steer the horse [18,49].

Documents also mentioned tack used for seating, including:

- no equipment with the clients sitting on the bare back of the horse (n=2) [25,51]
- a bare back pad, numnah, fleece saddle or saddle blanket, attached to the horse by a flat surcingle (n=17) [1,10,14,16,18,26,31,32,36,41,42,49,50,52,55,58,59]
- a saddle including an English saddle, Australian saddle, wool saddle or western saddle (n=11) [1,16,18,21,23,41,46,51,52,54,60]
- one author mentioned a saddle that was adapted to allow the client to feel the direct movement from the horse [21]

Some documents mentioned the use of 'stirrups' to support standing while the horse is walking, which became a treatment goal [1,10,21,23,41,42,50,58].

## **Discussion and implications**

In this scoping review we identified and described 19 hippotherapy concepts from 51 documents published between 2009 to 2019 and used the term 'hippotherapy' as found in these articles. Our review further emphasises the complex nature of hippotherapy, supporting the view that providers require advanced expertise in planning and providing therapy through the movement of a horse as an intervention tool. Hippotherapy is also a developing treatment strategy, with few studies focussing on professional reasoning when designing hippotherapy treatment plans.

We conducted this scoping review to comprehensively identify all the concepts, abstract and physical, that should be considered when conducting hippotherapy with CP clients. We started this scoping review in October 2019, shortly after Wood and Fields [2] published a mapping review in September 2019. We only became aware of the Wood and Fields [2]. review after we had completed our scoping review, but this posed no problem to our scoping review as we had excluded mapping reviews from our literature searches.

In their mapping review, Wood and Fields [2] focused on definitions of hippotherapy, hippotherapy components, clients receiving hippotherapy, and the general development of hippotherapy over the years. Our scoping review corroborates most of the conclusions made by Wood and Fields [2] however we also identified 11 new concepts, not mentioned by Wood and Fields [2]. These new concepts include human team members, horse temperament, horse breed, horse size, precautions, physical handling of the client, manner of leading, physical environment, temperature, therapy equipment, and horse tack.

In South Africa, EATASA [1] regards hippotherapy as a treatment strategy only used by OTs, PTs and SLP's as does the members of the summit group in the United States that focused on the terminology used for various equine assisted services [11]. The literature included in our scoping review suggests that other professionals also provide hippotherapy, but few studies describe specific training, roles, and contributions, concurring with Wood and Field's [2] findings. Given that hippotherapy is a complex intervention, we suggest that professional therapy providers require some form of post-graduate training and accreditation. We support the suggested use of therapy-first language where the professional qualification (OT, PT or SLP) is mentioned before further description of the specific equine-related therapy [11]. An example of such therapy-first language will be: occupational therapy using the movement of a horse [11]. However, this terminology was not yet recommended when the

scoping review was done. Furthermore, the document on terminology [11] mainly focused on the terminology used in the United States and these terms must still be accepted and implemented internationally.

Other team members that assist the hippotherapy provider may consist out of a horse handler and side walker. Although the scoping documents suggest that they too need training, specifics about their training were again negated.

The horse is central to hippotherapy, and we identified different horse-related concepts. While the literature was clear on the importance of temperament, few studies precisely described temperament. Horse breeds were not mentioned often (n = 6) as hippotherapy focusses on the type of movement rather than on the horse breed.

The movement of the horse is deemed important when matching a horse to a client [1,18,19,22,28,31,44,45,51,52,56] and in a therapeutic context, the ability of a therapy provider to influence the movement of a horse by directing the horse handler, is crucial [1,14,15,19,21,23,29,33,37,39,41,49]. Wood and Fields [2] confirmed the importance of horse movement and found that the ability to alter the horse's movements during a hippotherapy session was the second most commonly mentioned concept in their study. The ability to change the horse's movement may be linked to ground courses, such as school figures, inclines, declines, figure of eight or zigzags, in which the horse is directed to walk or trot. Yet, how the movement of the horse, while walking or trotting in different ground courses, influence the client were seldom mentioned [1,41,55,57].

In hippotherapy, the therapy provider usually designs the intervention based on the treatment goals. With this in mind, the therapy provider decides on how to position the client and how often the client will change positions in a therapy session [1,7,8,10,16,18,22,23,26,28,35,37,38,40-42,45,48-52,55,57,59]. Treatment goals and study outcomes in hippotherapy usually focus on improving body function and improving quality

of life. According to Wood and Fields [2] study outcomes have diversified over the past 30 years to include body function and structures, as well as, activity participation.

Experienced therapists routinely take precautions when planning and executing any therapy. Although not explicitly described as precautions, most documents specified that clients should wear safety helmets [24,31,32,50], belts [25], and footwear [24]. We recommend that hippotherapy studies should explicitly mention safety precautions to ensure the safety of clients. Post graduate training of service providers should also focus on precautions to ensure the safety of clients.

When describing hippotherapy sessions, activity characteristics can be detached from horse movement, clients position, and the characteristics of ground courses. All these concepts, however, form a critical part of hippotherapy. We found that some documents equate equine movement, activity, and ground courses. Hippotherapy activities included exercises such as stretching forward [1,8,10,18,27] and sport related activities such as placing rings on poles [1,10,18,22,51,52,55-57]. Less common activities include fine motor activities [1,18], cognitive games [1,18,56,57], communication [1,18], and tactile stimulation [1].

From our review, the physical environment where hippotherapy is conducted seems to be a pragmatic decision, based on the availability of facilities and environmental conditions. Hippotherapy can be conducted either outdoors or indoors in arenas of different sizes and with different surfaces. The influence of environmental temperature on therapy outcomes is seldom considered, but Dziuba [20] noted that hippotherapy goals are seldom achieved if the weather is too cold.

Although some documents mentioned tack for leading the horse [1,10,18,23,49,58] the use of specific tack for leading was rarely justified from a therapeutic perspective. Tack for seating the client [1,18,21,23,26,50] was more often mentioned from a therapeutic perspective, but the specific professional reasoning behind the choice was not given.

Currently, hippotherapy lacks a theoretical framework that encompasses all concepts. Evidently, studies on hippotherapy approach interventions from different theoretical angles. Some studies focus on the targeted outcomes of hippotherapy and use existing theoretical frameworks to plan and execute sessions [1,19,28,46]. Others focus on the dynamic movement of the horse [21,26,31,32,54] for example, how the rhythm of the horse influences muscle tone [14,24,25,27,60]. An empirical theory in hippotherapy is that sitting on a walking horse simulates the human walking pattern [1,7,10,17-19,27,52]. This rhythmic pattern positively influences muscle tone, equilibrium reactions, and sensory awareness [25]. The rhythmic movement of the horse, however, does not adequately explain other therapeutic outcomes, such as communication, speech, and visual perception.

Hippotherapy may benefit clients through social interaction, the bond with the horse [17,27,48,59] and how various internal and external systems influence one another. All these theoretical explanations need to be scientifically formulated for a hippotherapy theoretical framework. We suggest that while the horse's movement can be seen as a therapy tool, hippotherapy with all its identified components and complexities should be viewed as a treatment strategy in its own right.

Future research should focus on outcome-based evidence regarding effectiveness and efficiency when the newly identified transdisciplinary hippotherapy concepts are implemented. This includes, but is not limited to, research on the role that relationships between the team members play, the effect of horse movements on the client, ideal environmental conditions for hippotherapy interventions, ideal seating support needed and how different activities contribute to reaching therapy goals.

## **Limitations**

As this scoping review only focused on the identification of hippotherapy concepts, other perspective on the nature of hippotherapy might have been omitted.

The professional reasoning behind the implementation and interaction between the concepts were absent in most scoping documents and fell outside the scope of this scoping review.

## **Conclusion**

The literature included in this scoping review revealed 19 concepts. These findings informed the development of transdisciplinary practice guidelines for clients with spastic CP. By identifying hippotherapy concepts, we have filled a gap in the early phases of scientific development of hippotherapy.

These concepts contribute to our understanding of hippotherapy. We encourage therapists and researchers to include all these concepts in treatments and studies, as well as explain their decisions from a therapeutic perspective. Such reasoning will allow more detailed research and benchmarking between studies.

## **Disclosure statement**

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