

## Supplementary Material: Template for Intervention Description and Replication (TIDieR) Checklist

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### Template for Intervention Description and Replication (TIDieR) Checklist

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<b>Name</b>	Therapeutic horse riding (THR) in New Zealand context (specifically Christchurch RDA group)
<b>Why: rationale, theory, or goal of the elements essential to the intervention</b>	No generally accepted theory to underpin THR intervention currently
<b>What: materials</b>	<p>Horse acts as therapeutic medium and is trained for use in a therapeutic riding context.</p> <p>NZRDA trained coach (voluntary role) oversees THR session</p> <p>Volunteers working in various roles including side-walkers (1 or 2 per rider) and horse-leaders (1 per horse)</p>
<b>What: procedures</b>	<p>Mounted and un-mounted activities. May include any or all of following:</p> <ul style="list-style-type: none"> <li>• Preparing self for riding (helmet, footwear)</li> <li>• Meeting horse and introducing self to horse at the start of session</li> <li>• Preparing horse for riding (helping with putting on equipment, warming horse up by leading it around arena)</li> <li>• Mounting horse – sitting on either a saddle or a sheepskin</li> <li>• Being placed in a variety of positions on horse as it is led around the arena</li> <li>• Practicing correct postural alignment while mounted, and while completing a range of activities</li> <li>• Participating in a range of activities and games while mounted on horse (either solo or in a group activity situation)</li> <li>• Learning riding skills such as ‘start’ and ‘stop’, steering with reins, trotting and cantering</li> <li>• Dismounting from horse</li> <li>• Taking equipment off horse, cleaning equipment and stowing it</li> <li>• Assisting with horse care tasks such as taking out to stalls, feeding etc</li> <li>• Taking rider safety equipment off</li> <li>• Washing hands</li> </ul>
<b>Who: intervention provider</b>	<p>RDA Coach: directs THR sessions</p> <ul style="list-style-type: none"> <li>• at least 18 years of age, with good communication, management and teaching skills.</li> <li>• has sufficient knowledge of riding, horses and disabilities.</li> <li>• has a commitment to maintaining safety.</li> <li>• Is prepared to undertake NZRDA training.</li> </ul>

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	<p>Training requirements as part of NZRDA. There are two coaching qualifications offered on National Qualifications Framework (NZQA):</p> <ul style="list-style-type: none"> <li>• National Certificate in Equine (RDA Coach) level 5</li> <li>• National Certificate in Equine (RDA Assistant Coach) level 3.</li> <li>• All NZRDA Coaches are required to have a current First Aid Certificate.</li> </ul> <p>Side-walkers and horse-leaders:</p> <ul style="list-style-type: none"> <li>• 14 years or over to volunteer at an RDA Group.</li> <li>• required to attend a Volunteer Training Course within their first six months of assisting at an RDA Group, and bi-annually thereafter. This course provides the opportunity for participants to learn about the philosophy, structure and role of NZRDA, health and safety requirements and basic skills required for a volunteer to be an effective RDA team member.</li> </ul> <p>A professionally trained therapist is available on a consultative basis. Registered New Zealand Physiotherapists and Occupational Therapists who hold a current New Zealand Practicing Certificate can work in an RDA group and provide programme advice and support to RDA Coach or Instructor.</p>
<b>How: modes of delivery</b>	<p>Delivered in group sessions made up of 5-6 riders. The coach oversees the delivery of sessions. Each rider has their own horse and the support of up to 3 volunteers (one horse lead and up to 2 side-walkers) depending on their ability level on the horse.</p>
<b>Where</b>	<p>[Christchurch RDA specific]          Purpose built indoor riding arena based at an urban agricultural park. The clear span riding area is 40m by 80m with a Kakahu sand/clay mixture surface. A viewing area, toilets, seminar room and office are located on 10m wide concrete pad along east side. The eave height is 6m with a sloping safety wall around the riding area. The surrounding agricultural park is also available for outdoor riding.</p>
<b>When and how much</b>	<p>Optimum dosage/frequency has not been ascertained within the literature. At Christchurch RDA, riders can attend THR sessions for a period of one year - a total of 35 weeks per year (excluding school holiday weeks during which the RDA group is not functioning). Riders attend sessions weekly with each session lasting for 1 hour in total.</p>
<b>Tailoring</b>	<p>THR intervention sessions are tailored to individual needs of riders. This is achieved principally through setting goals, which then feed into session objectives. The session coach, in liaison with the rider and their caregivers and/or parents, establishes goals. A professional therapist may be consulted on the setting of goals, and in the development of session content, particularly in the case of rider with physical impairments.</p>

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## Supplementary Material: Matrix showing key CMO configurations and ‘if-then’ statements, with examples of data supporting analysis

Phase findings that support the development of CMO configurations	Examples of data supporting analysis
<p><b>Participation in an accessible activity</b></p> <p>1. <i>If children and young people who experience disability are involved in THR as an accessible activity [C] <b>then</b> this will lead to the development of riders’ self-concept by providing increased opportunities to view themselves in more positive ways [M] and will contribute to improved social participation outcomes, often reported as happening in other home, school and community settings [O].</i></p>	
<p><b>Phase 1: THR environment allowed riders to participate – increased repertoires; often limited options in other settings</b></p>	<p><i>Adam can’t join in with other activities, whereas THR can be individualised to address these issues. [He struggles with] the comprehension of the game. And he doesn't run all that well. (Mother, Adam)</i></p> <p><i>Int: So, what do you do when you’re not riding [due to being put back on a waitlist]?</i></p> <p><i>Jack: Stay at school [while other children do sports activities].</i></p> <p><i>Int: You stay at school. How does that make you feel?</i></p> <p><i>Jack: Bored.</i></p> <p><i>Int: You’ve got two thing that you do - your riding and your swimming. Do you replace the riding with anything else when you’re not coming? Have you tried different things?</i></p> <p><i>Mum: Once he went to power chair soccer. And did you like it?</i></p> <p><i>Jack: No, not really.</i></p> <p><i>Mum: Yeah, because he hasn’t got full movement of his arms, he can’t do wheelchair basketball, or wheelchair rugby or anything like that. So we need something that you don’t have to use your arms for much, aye?</i></p> <p><i>Jack: Yeah.</i></p> <p><i>Mum: So, horse riding’s perfect.</i></p>
<p><b>Phase 1: riders and carers prioritise THR as being a leisure activity they could participate within (over viewing it as a treatment modality)</b></p>	<p>THR was accessed by riders primarily because it was an inherently meaningful activity to participate in and of itself, rather than because of a particular therapeutic effect. Specific reasons that caregivers gave for their child accessing THR included: to allow their child to experience a hobby and participate in a leisure activity; to access a sporting activity that</p>

Phase findings that support the development of CMO configurations	Examples of data supporting analysis
<b>Phase 3: COPM score changes showed most consistent change between riders, compared to other health outcomes including balance, activities of daily living, social responsiveness and quality of life outcomes.</b>	<p data-bbox="759 308 1966 411">accommodated their child's level of functioning; to help their child participate in an activity that was shared by the whole family; to provide an opportunity to interact with and care for an animal; and to engage in an activity that was normalising in relation to the child's peers.</p> <p data-bbox="759 435 1973 611"><i>I just thought oh, it'd be nice if they get to do something that is fun, and maybe they can feel proud of, and other kids do it. You know, neuro-typicals go horse riding. And it's like 'well we go horse riding too.' So yeah, that's nice too, that it's like 'yeah, you're off to do this, this, and this - well we're off to do this.' So, you know, you can have a sense of pride in the fact that you're doing a really interesting activity, something cool. (Mother, Kororo and Hoiho)</i></p> <p data-bbox="759 635 1928 738"><i>As an active, outdoor family, we are looking forward to having a pursuit that we can share. [Our child] loves riding and we find the whole experience extremely positive (parent; testimonial 5).</i></p> <p data-bbox="759 778 1980 882">Self-identified social participation goals measured using the Canadian Occupation Performance Measure (COPM) demonstrated the most consistent positive change across riders (performance ES = 1.20, 95% CI [.82, 1.63]; satisfaction ES = 1.11, 95% CI [.73, 1.55]).</p> <p data-bbox="759 906 1980 1233"><i>Because for Olivia - her grasping of things, like instructions and things, she's gone from just being able to follow one instruction to now following two or three at a time. ... So that to me is brilliant, and that, so the improvement is there, and at school, they have noticed as well. And when riding came up, and I said that it's in school time again, and the [teachers] said 'don't [miss it]- do it.' They said, 'do it.' And that, because it's- they've noticed the change in her, the benefits that she has. Her writing, and that, so they incorporate her riding and that into her story writing and all those sorts of things. So, I- yeah, definitely therapeutic in every aspect. It's broad spectrum, really. From body strength to her mind. So yeah, it's amazing. (Mother, Olivia)</i></p>

Phase findings that support the development of CMO configurations	Examples of data supporting analysis
<b>Promotion of capacities and strengths</b>	
2. <i>If riders experience the THR physical and ideological space as being niche, novel, fun, challenging, risky, safe, individualised and normalising [C] then riders will perceive that their capacities and strengths are focused on, rather than their difficulties [M], and this will contribute to positive development of their self-concept, facilitating an emerging view of self as someone with skills and abilities [O].</i>	
<b>Phase 2: THR therapeutic landscape is experienced as focussing on capacities</b>	<p><i>But I really notice [with Hoiho], if she hops on the horse, she just has this look on her face, she's beaming. She- for the first session, the whole time she just was so calm and still, and just like this big smile that I haven't seen- it's almost different, a different kind of smile. I think- I might have a photo I can show you, that one. Yeah, this is it. This is not a smile that you get to see anywhere else. (Mother, Hoiho)</i></p> <p><i>And I think confidence, as well, for Guy. You know, being able to deal with change, and something quite exciting, and big, and – yeah. He used to be very petrified of anything different. He liked [things to be] the same. So yeah, now he knows when he gets here, he can get onto the horse, and they do all sorts of exciting things, and he would express that vocally, he'd be 'oh, oh, I don't like it,' when he first came. But now he does, and he smiles, and he's laughing, and he's ready to go. (Mother, Guy)</i></p>
<b>Phase 2: blossoming and flourishing; self-concept development</b>	<p><i>Well, just getting up on the horse, and not being afraid. And just watching her blossom, her confidence, her self-esteem changing. ... I just wish that the school, the people at the school could come and see, because she's totally different than what she's at school. She's in a different environment, but it's her environment, and she's happy. And I- that's the biggest joy I get. (Mother, Olivia)</i></p> <p>Riders particularly and consistently prioritised opportunities to ride outside (i.e., riding away from the covered arena in the surrounding agricultural park setting) in their interviews, selection of favourite aspects of the THR photographs, and as observed in the THR sessions. 'Being outside' seemed to take on a more symbolic dimension for many riders. When riding 'outside', they experienced themselves as engaging with the known world but in new ways and</p>

Phase findings that support the development of CMO configurations	Examples of data supporting analysis
	<p>seeing things from a different perspective. They also appeared to feel different - changing and growing into an altered self or a new self-identified role. For riders, this was often expressed in terms of new character roles that they took on in the ‘outside’ landscape – for example, describing themselves as being a ‘knight’, or a ‘cowboy’.</p> <p><i>Mason enjoyed going outside and riding in a more ‘real way’. I wonder whether he is bored in the arena. He seems to get some pleasure out of being ‘a rider’ .... rather than just completing tasks on a horse. (Field note)</i></p> <p>Learning to succeed appeared to result in riders feeling more capable and feeling proud of their achievements. This pride was frequently evident in the sessions when riders demonstrated both verbally and through their body language that they felt successful. These moments of success also appeared to contribute to riders seeing themselves in new ways and therefore contributing to their expanding self-concept. One example of this within the data was when Thomas was shown a video of him trotting during the THR session. Thomas was smiling and pointing at himself in the video, signing ‘me’ repeatedly. He appeared to link his success with trotting to how he viewed himself. Caregivers also valued similar moments of success and celebrated with their children. Caregivers observations of success within the THR landscape also appeared to be instrumental in contributing to the development their perceptions of their child’s capabilities and developing self-concept.</p>
<b>Phase 1: having a ‘story to share’</b>	<p>Participating within the THR landscape experience appeared to lead to riders connecting more widely within their home, school and community contexts because they had a unique and successful story to share. Their THR experiences enabled riders to connect into a wider family narrative.</p> <p><i>There's just something about seeing that pleasure on your child's face, and knowing it obviously provides a discussion topic, but it just – I mean Tobi talks about it all week. (Mother, Tobi)</i></p>

Phase findings that support the development of CMO configurations	Examples of data supporting analysis
<b>Riders as active agents</b>	<p>3. <i>If riders are allowed opportunities to practice agency in THR sessions, rather than passive participation [C] <b>then</b> this will optimise opportunities for learning [M] and will contribute to the development of self-concept regarding how they move, what they perceive themselves as being good at, who they connect with, and how well they cope with change in settings other than THR [O].</i></p>
<b>Phase 1: Role of THR providers in facilitating learning experiences; challenge and progression required to facilitate ongoing learning</b>	<p><i>Yes, but [it's] part of the whole experience. And it's part of that socialisation. And Tama associates the [RDA providers] in a happy way because he is doing something that he is really enjoying as well. You know [the RDA providers] are a means for him to be able to be on the horse... And as I say for him, I think the people make it as much as the horses. And I think it's an interaction thing because the horse can't be proactive in interacting with him, but the people can. (Mother, Tama)</i></p> <p>Riders felt more engaged when they were challenged. I frequently observed different riders exhibiting increased attention and effort within the session when they were provided with more challenge.</p> <p>I noticed that Mason's posture was significantly more upright when [the horse] was off the lead rope. I felt that this change of posture reflected a level of engagement and deeper immersion within the task itself. More challenge seemed to lead to more self-initiated action by Mason. (Field note)</p>
<b>Phase 2: Facilitation of learning experiences rather than the application of therapeutic tasks and activities; THR is an interactive and dynamic experience that riders encounter and become part of</b>	<p>Participants perceived THR as providing appropriate levels of challenge, allowing riders to feel capable and to gain a sense of mastery through the provision of achievable activities and tasks. Field observations also suggested that sessions were set up to optimise their chances of success and that the success experienced by riders was both tangible and direct due, in part, to the immediate feedback provided by the horse in response to rider actions. Gaining a sense of mastery through the acquisition of technical riding skills appeared to play a role in riders</p>

Phase findings that support the development of CMO configurations	Examples of data supporting analysis
<b>- not just the application of tasks and activities</b>	<p data-bbox="759 308 1991 483">learning to succeed. Learning to control and guide the horse, to maintain an optimal riding position and to complete tasks while riding, were valued outcomes of THR. This was evident in the interview data, session observations and in the riders' preference for photographs that depicted their riding skills and competence. The following field note alludes to one rider's experience of success within a THR session.</p> <p data-bbox="759 507 1991 762"><i>At times Spatz [the horse] would not walk on. This clearly upset Rosie [rider]. It seemed to me that in this context, being able to control the horse and successfully complete activities without the lead rope on was critical to her experience of success. This interpretation of Rosie's response was further supported when she successfully managed to get Spatz to walk onto an elevated plinth and stop Spatz in the middle of it. Rosie gave a huge smile and looked to check if her mother had seen this. It seemed clear that Rosie was feeling a sense of pride in being able to achieve a specific task without support successfully. (Field note)</i></p> <p data-bbox="759 786 1991 1106">Caregivers often described the opportunities for their children to experience success as being a unique feature of THR. Riders' pride in their achievements was frequently evident within sessions where riders demonstrated both verbally and through their body language that they felt successful: e.g., 'Logan was observed successfully steering his horse through an obstacle course and on accurate completion he exclaimed with evident pride, 'It worked!' (Field note). Learning to succeed appeared to lead to riders demonstrating a sense of empowerment and autonomy within the THR landscape. Through the successful completion of tasks, including being able to control the horse, they appeared to then demonstrate increased self-advocacy and choice making</p>
<b>Phase 2: 'Where the tools are gathered' facilitates learning</b>	<p data-bbox="759 1150 1991 1364">Riders experienced THR as more than merely the application of horse-related techniques, tasks and activities. Instead, riders were embedded within a holistic therapeutic landscape, conceptualised as the complete physical, social and ideological space the riders engaged within. However, the therapeutic nature of the space was not inherent in the space itself, but instead, it emerged from the range of actants, events, practices, and processes coproduced within the space. The THR landscape was experienced by riders and caregivers as including: the arena,</p>



Phase findings that support the development of CMO configurations	Examples of data supporting analysis
	<p>paddocks and stables (i.e., the physical area and built environment); the relationships with RDA providers, caregivers, and the horse; the THR intervention tasks and activities (i.e., therapeutic techniques) completed within each session; and the ideological landscape (e.g., risk management systems). Specifically, the THR landscape was experienced by riders as being a place that was particularly suitable for them; niche, novel, fun, challenging, risky yet safe, individualised and normalising. However, none of the THR landscape experience components were experienced independently of each other. Instead, they appeared to interconnect and interrelate to influence each other. That is, the landscape was experienced as being niche but also novel; risky, but also safe, and fun but also challenging. Additionally, the novelty was challenging in, and of itself, individualised experiences ensured ongoing novelty, and being 'overly safe' mediated the degree of challenge experienced by the child. As indicated in the following quote, riders perceived that they were participating in an activity with interconnecting and interactive components.</p> <p><i>Well, I think it's good for [Korora and Hoiho] to interact with animals, I think that's really important. I think it's a fun way of doing things without thinking they're doing anything... and it's hard- you know, hard yakka [work], and riding is just a fun way, and they're getting a lot without- you know, it's an hour and- well, at least 40 minutes on the back of a horse, and it's- you know, it's never a complaint. So, I think that's what's great about it. And I also think just the interacting with the volunteers as well; I think that all helps as well. Feeling of independence possibly, for Korora and Hoiho [riders], the physical independence of being able to you know, keep up with other people. (Mother, Korora and Hoiho)</i></p>

## **Supplement Material: Case Study**

*NB: This case is based on one of the participants within the study, however, key information has been changed to ensure anonymity.*

Maria is a NZ European 8-year old female with cerebral palsy (spastic diplegia). She had accessed THR in the past, completing weekly sessions during school term times over a one-year period. Her mother had sought further THR for her daughter as she felt it would improve her ability to move her body more independently, and with greater control. On initial assessment, Maria scored 42/56 on the Pediatric Balance Scale and 45/100 on the Activities Scale for Kids – performance (ASK-p) measure. She could walk independently within his home but used a frame when in community settings. The main domains of the ASK-p in which Maria reported difficulties included ‘standing skills’ (e.g., carrying objects while walking) and ‘play’ (e.g., keeping up with friends when walking). Her Social Responsiveness Scale (SRS) T-score was 58 on initial assessment indicating her reciprocal social behaviour to be within normal limits.

Apart from THR, Maria was involved with physiotherapy, occupational therapy, and speech and language therapy sessions once per week. She attended a local school with his peers in a full-time capacity. Recreationally, she participated in swimming once per week, and enjoyed riding her bike (with trainer wheels) around the local neighbourhood.

Maria’s goals (established as part of Canadian Occupational Performance Measure [COPM] administration) were:

- To run (and jump) to keep up with her sister when playing with her at home
- To ride a 2-wheeler bike (without trainer wheels) around the local neighbourhood
- To use monkey-bars at school at playtime (“so I can join my friends”)
- To walk without using a frame at school and over long distances

### **THR provides a positive participatory experience for disabled children:**

Maria could participate in the THR landscape despite her various physical, social and behavioural impairments. She had not been able to find any physically based activity (other than swimming) to do throughout the week. Football was too fast for her, and she lost her balance when trying to kick a ball. Maria had tried tennis, but her balance was not developed enough for her to feel like she was good at it – she always went home after sessions feeling

sad. She loved swimming, but Maria didn't really get to know the other children in her group as she tended always to be the last to finish the set tasks within each session.

Maria enjoyed the freedom of movement she experienced when riding the horse, and she loved that she could keep up with other riders. She enjoyed relating to the other riders as they completed some of the group tasks, loved sharing jokes with the THR providers – the coaches, side-walkers and horse-leads. She talked about how proud she was of what she was able to do in the THR sessions – learning to ride off the lead rope (i.e., fully controlling the horse on her own) and steering the horse to complete set tasks and activities. She particularly loved riding in the outdoor space – away from the THR arena. Maria also loved writing about THR and sharing her story with her friends at school. While she felt that she had improved her performance and satisfaction all her social participation goals, it was her ability walk without her frame more frequently at school, and to play with her friends on the monkey-bars at playtime, that she was most proud of. It was in these two areas that Maria rated the most improvement in her COPM goals. Maria's COPM performance and satisfaction scores (averaged for all four goals) were both scored as 1 at the start of the THR programme, and increased to 4.75 after 12 weeks of THR – an improvement of 3.75 for both performance and satisfaction scores, with an increase of 2 being considered clinically meaningful.

### **THR supports the development of a child's self-concept by emphasising their capacities and strengths.**

How Maria experienced the THR landscape played a crucial role in optimising her health outcomes and appeared to contribute to the development of her self-concept. Maria had been involved in lots of assessment and therapeutic interventions since she was very young. Usually, professionals and therapists started by asking her what her problems were and then said they would help her to fix those problems. As soon as Maria started at THR, she was able to get on the horse and keep up with the other riders. THR providers talked about what she could do, emphasising the new skills she was learning. She gradually became more confident in trying new activities and increasingly required less parental encouragement and support to engage. She loved trotting!

Maria parents made sure that they took some time off work to see Maria at THR sessions because they loved seeing her smile and laugh in a way that they did not see in other contexts. They had watched her 'do' and 'achieve' things with therapists in the past – but this was different. THR seemed to change how she felt about herself. She frequently wanted to look at herself in the wall mirror – as if seeing herself for the first time. Maria asked her

parents to take photos of her riding so that she could send copies to her grandparents. She wrote a number of stories about what she was able to do at THR and how proud she felt.

### **Health outcomes are optimised when riders are able to play an active role in THR sessions.**

Maria was much more engaged in the THR sessions when she had more control over (a) what she could do in the sessions, and (b) the amount of control she had over the horse within the session - even though this was often challenging for the THR providers as they were really concerned about making sure that she was safe. Maria increasingly saw herself as moving, succeeding, connecting and adapting within the THR session, but she also translated this new view of herself into other settings.

*Maria learnt to move:* her balance gradually improved over the sessions to the point where she was able to trot - with close running alongside supervision! But she also started to talk about her physical self and the things she could do with her body. This newly emerging understanding of her physical capacities led to her feeling brave enough to try the monkey bars at school.

*Maria learnt to succeed:* One session, Maria decided that she wanted to steer her horse to walk onto a raised plinth, and then make it stop with all four legs on the plinth. After many attempts she finally got the horse to understand her commands. At this point, she looked over to where I was sitting and yelled: "I did it!". Over the following weeks as Maria succeeded in tasks within the THR sessions, Maria's mother reported that she also became more willing to try new tasks at home and school.

*Maria learnt to connect:* the THR landscape (including the attitudes of the THR providers and the non-threatening space) led to Maria feeling much more comfortable to try new things. She also became more confident to talk to a range of adults and other kids who were riding, along with friends at school and grandparents. She had something to talk about – something she felt good about.

*Maria learnt to adapt:* initially, she wanted her parents to be with her (i.e., walking beside her). But quite quickly she got to the point of asking them to stay in the seated area of the indoor arena. She asked to try new (and what she perceived as being risky) tasks and activities. Maria increasingly seemed to be keen to act courageously, and she started talking about the new things she might try when not at THR now that she was 'brave'.