

Australian Physical Activity Clinical Practice Guidelines for people with moderate to severe traumatic brain injury: Public consultation, 2023

The draft *Australian Physical Activity Clinical Practice Guidelines for people with moderate to severe traumatic brain injury* (TBI) was released for public consultation between 4 September 2023 and 6 October 2023 in accordance with Section 14A of the Commonwealth National Health and Medical Research Council Act 1992 and accompanying regulations. The guideline was hosted by partner organisation Connectivity (www.connectivity.org.au), along with an online public consultation submission template to capture public feedback and comments about the guideline. Links to the guideline and submission template were circulated via electronic mail (e-mail) to key stakeholders identified by the Guideline Leadership Group and were invited to make submissions. The link to the guideline and submission template was also included in the fortnightly '*NHMRC Tracker*' newsletter (11/09/2023) and was circulated via the personal social media accounts of the guideline chair and co-chair (A/Prof Hassett and Dr Johnson, respectively), and institutional-linked social media accounts (i.e., Connectivity; Institute of Musculoskeletal Health, University of Sydney). We received seven responses during the public consultation, six of which were from physiotherapists, and one was from an exercise physiologist.

We received endorsement for the guideline from Exercise and Sports Science Australia (ESSA, who provided feedback on the guideline – see below), and Rehabilitation Medicine Society of Australia and New Zealand (RMSANZ). The following organisations have also agreed to consider endorsing the guideline following NHMRC approval of the guideline: Australian Physiotherapy Association (APA), Royal Australian College of Physicians (RACP), and Australasian Faculty of Rehabilitation Medicine (AFRM).

Consistent with NHMRC requirements (NHMRC, 2018), and in parallel with the public consultation period, the guideline was distributed to independent reviewers for clinical and methodological review. Eight independent reviewers were chosen by the Guideline Leadership Group, with their names, contact details, areas of expertise relevant to the guideline, and reasons for nomination submitted to the NHMRC along with the draft guideline, to facilitate the independent review.

De-identified submissions from the independent reviewers, individuals as part of the public consultation period, and ESSA, and our responses, are tabulated below.

Independent Expert Review		
Reviewer One (Netherlands)	NHMRC Comment	Developer Comment and action taken
I am not aware of any appropriate evidence that has been overlooked in line with the scope and clinical questions.	For noting. No action required.	Thank you for your feedback. No action taken.
I think the risks and potential harms of the recommendations have been fully considered.		

	<p>To my knowledge there are no conflicting guidelines. The guidelines are an important addition to the 2020 WHO guidelines on physical activity and sedentary behaviour, especially the specific guidelines on people living with a disability.</p>		
	<p>Reviewer Two (Australia)</p>		
	<p>The appropriate evidence has been identified and reviewed. However, the guidelines are based on a small number of studies, or the findings are extrapolated from other diagnostic groups. I would support the use of weak rather than conditional as a more appropriate description of the evidence base to convey the lack of evidence or small number of studies more accurately – at least in relation to some of the questions.</p>	<p>Please review these comments and consider whether the strength of the recommendations reflect the evidence base.</p>	<p>We believe the strength of the recommendations to be an accurate reflection of the evidence base, including the direct and indirect evidence informing the recommendations. The term '<i>conditional</i>' was chosen to avoid the potential unintended negative connotations and confusion often associated with the use of the term '<i>weak</i>' in this context. The explanation for the meaning of the term '<i>conditional</i>' is the same explanation used for the term '<i>weak</i>', as per Schunemann et al (2013). This is explained in the guideline documents. We have chosen to retain the use of the term '<i>conditional</i>', therefore no action has been taken.</p>
	<p>The risks and potential harms of recommendations have been fully considered in the context of clinical practice. However, I question the need to specifically mention ballistic strength training in the actual recommendation for adults, particularly if the consumers are a target audience. I appreciate that there is some high-quality evidence to support this type of resistance training, but wouldn't this be something to include as good practice point rather than the recommendation? Consumers or health professionals without the appropriate training may not be well-positioned to implement ballistic strength training safely and effectively.</p>	<p>Please review these comments and consider if ballistic strength training should be included in a practice point instead of a recommendation.</p>	<p>For this clinical practice guideline, the target audience are health professionals working with people with msTBI. And several health professionals, including physiotherapists and exercise physiologists, were involved in the Guideline Development Group that developed and voted on the recommendations, including their wording. The inclusion of '<i>ballistic strength training</i>' in the recommendation reflects the strength of the evidence for this recommendation arises predominantly from the Williams et al. (2022) RCT which demonstrated the beneficial effects of ballistic strength training in this population. Progressive resistance training has been shown to improve muscle strength in neurological population, such as stroke and TBI, but these improvements do not carry over into improvements at the activity level (i.e., mobility) (Dorsch et al., 2018; Williams et al., 2014). This is primarily because strength training interventions have not targeted the main muscle groups that provide the majority of power generation for forward propulsion, nor are exercises performed at sufficient speed to replicate the requirements of the task (Williams et al., 2014). To improve walking and other high level mobility tasks, muscle groups involved in these tasks need to be able to contract with strength and speed. Ballistic exercise training can improve muscle power generation and is safe and feasible in neurological populations (Cordner et al., 2021).</p>

			An audit conducted by Guideline Leadership Group member Prof Gavin Williams found ballistic training was being delivered by health professionals in neurorehabilitation (Williams & Denehy, 2019); we found similar results in our audit for this guideline. We have also included a definition of the term ' <i>ballistic strength training</i> ' in the guideline document.
	I am unaware of any evidence-based guidelines or recommendations that conflict with this guideline.	For noting. No action required.	No action taken.
	In closing, I would add two minor comments. First, the term "aerobic play" is not developmentally appropriate for children or consistent with the physiological energy systems children utilise when sporadically engaging in active play or physical activity. I would recommend the term energetic play.	Please review this comment and consider amending the term 'aerobic play' as suggested.	We consulted a member of our guideline development group with paediatric experience who concurred with the Reviewer. As per the reviewer's comment, we have replaced the term ' <i>aerobic play</i> ' with ' <i>energetic play</i> ' as suggested for clinical question 2.
	Second, the section on monitoring and evaluation should include information about the feasibility, validity, and reliability of the measures they include as an appendix for monitoring and surveillance purposes. To my knowledge the psychometric properties of the proposed child measure has not been evaluated in children and youth with disability or TBI. The need for future research to establish valid policy relevant measurement tools for use in clinical practice should be clearly stated in the report, and the recommendation to use the tools in the report should be restated or removed.	Please consider these comments and respond to the issues raised by the reviewer	The literature was reviewed to identify brief measures of physical activity for adults and children. We did this with the hope that a brief physical activity measure will be able to be included in the broader AUS-TBI work to embed measures into clinical practice and added to a data registry. The brief child measure is based on a measure designed and used in primary care for adolescents with testing of psychometric properties (Prochaska et al., 2001) as well as vital signs physical activity measure (Wald et al., 2018). The measure has not been evaluated in children and adolescents with disability and this limitation (and need for future research) has been added to our section on monitoring and surveillance.

	Reviewer Three (Canada)	NHMRC Comment	Developer Comment
	Yes, the appropriate evidence been identified and reviewed in line with the scope and clinical questions posed by this guideline. I must compliment the development group on a highly rigorous and scientifically valid process for development. I particularly found the multimodal development process with inclusion of people with lived experience in the interpretation of the evidence and development of the recommendations. I do not believe any relevant evidence has been overlooked.	For noting. No action required.	Thank you for your feedback. No action taken.
	Yes, I do believe that all the significant risks to people with TBI have been fully considered.		

<p>There are no international or other guidelines that are in conflict with the recommendations that have been provided.</p>		
<p>My main concerns are related to:</p> <ol style="list-style-type: none"> 1. Implementation tools for the recommendations. This is an issue for most international guidelines that they need to help the target users who are often fitness trainers and community therapists, school teachers etc. 2. Sustaining exercise/behavioural change amongst people with TBI 		<p>The development of tools to support implementation is planned as the next phase of our work. We have submitted a funding request to support the development of tools to support and enable implementation for target users, such as physiotherapists and exercise physiologists. This will include training modules and digital resources suitable for people working with people with msTBI (e.g., support workers, fitness trainers) to increase uptake and support long-term maintenance of exercise and health-promoting behaviours.</p>
<p>Regarding implementation: I agree with all the recommendations and the authors have provided good practice points which may be helpful for the target audience. I believe that to be better able to implement these recommendations these could be enhanced by providing some more guidance to address the following issues.</p> <p>How do the good practice points help to overcome the barriers identified in your qualitative research and discussions with people with lived experience of TBI?</p> <p>Could you provide bit more guidance in good practice points on access to Equipment in responding to this comment below?</p> <p><i>"I find one of the biggest barriers is if they're wanting to get back to community sport or engage in regular exercise that they may have been participating in prior to their injury and are really motivated to get back to that, some of the barriers around access and appropriate equipment, support to be able to get them there, often they're not driving. I think those things become quite difficult, so it's probably more so around appropriate equipment, access and support for transport."</i> (Health professional)"</p>	<p>Please review the comments and consider if additional guidance should be included.</p>	<p>Thank you for this feedback. Because the barriers identified by the stakeholders in the BRIDGES qualitative research were more broadly about physical activity in the community, we have added this information into the "impact of clinical recommendations" section for clinical questions 9 and 10 about promoting physical activity.</p> <p><i>"• Tailored physical activity interventions need to consider personal (i.e., levels of fatigue, physical conditioning, sensory sensitivity) and accessibility (i.e., appropriate equipment, safety and support, and environment) factors. Identifying opportunities for people with msTBI to be physically active in a social environment, undertaking motivating, interesting and enjoyable activities is likely important for long-term adherence to physical activity. Advice/input from psychologist or other relevant health professional may be required to assist with managing cognitive/behavioural impairment".</i></p>
<p>In the good practice points, would the team be comfortable adding specifics about types of exercise or other strategies that those people have reported?</p> <p><i>"So one of my clients, she was always really liked swimming, so her mobility with walking out of the pool isn't fantastic, but getting her in the pool and completing walking exercises in there really works for her."</i> (Support worker)</p> <p><i>"we had a few little places we could refer to around [our area], but nothing with a ceiling harness, for instance, where I could put someone up in a ceiling harness to do gait training and engage them in exercise that way. So there was quite a few limitations, I didn't have all the tools in the box as a therapist, and to have all those tools in the box, it's so cost prohibitive."</i> (Health Professional)</p>	<p>Please review the comments and consider if additional guidance should be included.</p>	<p>We have a pending funding request in to support the development of resources for implementation to overcome the types of barriers mentioned by the reviewer. For example, if funded, we plan to create video case studies of a variety of people with msTBI participating in a range of different physical activities to showcase different types of physical activity and how different people have overcome barriers to participate. This resource was suggested by multiple stakeholders, including people living with msTBI.</p>

<p>How could the issue of Fatigue be further and more specifically addressed in the good practice points?</p> <p><i>"... virtually every day, I start out knowing I'm depleted before I start.... If I push past points, all the symptoms occur.... You want to participate, but you've got to try to keep a lid on the symptoms or manage them, because you pay price or I do. there's a whole lot of logistics that I never would've had to think about before at all, that now are logistics to ensure I don't have another accident, or hurt myself, or fall over, or any number of bonkers things that can happen when you're exhausted and beyond exhausted." (P1)</i></p>	<p>Please review the comments and consider if additional guidance should be included.</p>	<p>We have reviewed our good practice points and added the fatigue good practice point to the adult aerobic exercise recommendation.</p> <p>GPP 1.7: "Timing of aerobic exercise training considers the impact of fatigue on behaviour and participation in other activities including work and/or study."</p>
<p>Would it be reasonable to add something about considerations for exercise like seeking quieter environments and providing more orientation in community facilities etc?</p> <p><i>"I can't handle too much stimulus from the outside. So, if ... there's a lot going on.... a lot of people moving in different directions.... One, I get physically exhausted. And then secondly, I can't cope with what's going on and I have trouble with directions. Like typically going to a toilet down corridors, left, right, this way, that way, I'll get lost. And that's what I find at the gym too. You just get lost.... my brain almost shuts down and I just freeze." (P13)</i></p>	<p>Please review the comments and consider if additional guidance should be included.</p>	<p>The additional aspect added to "impact of clinical recommendations" for clinical question 9 and 10, in particular noting 'sensory sensitivity' as an additional consideration, addresses this point. It will depend on the persons' impairments and other personal factors as to whether a quieter or a more stimulating environment is needed.</p>
<p>Recommended adaptations for safety?</p> <p><i>"I can't go to the gym by myself, because I don't remember what I'm supposed to do with the machines and how I actually do it, so I have to have somebody come with me.... I can't just go walk my dog on my own, because I could fall over. So everything that I do physically now has to have somebody there with me. So I can't even just go for a walk around the block without having somebody there to make sure that I'm okay. So it's a little bit harder.... I can't drive. So anything that I go and do, I have to have somebody to take me there and it's limiting. Public transport where I live is there, but it's hard to get to. So again, I've got to have somebody drive me to get there. So the sort of independence that other people have, I don't have.... If I could get to places ... under my own steam, I would be really excited and would go and do things more often. But I just can't. So I have to understand my limitations and be okay with those to then try and see what else I can go and do." (P2)</i></p>	<p>Please review the comments and consider if additional guidance should be included.</p>	<p>We have added 'safety' to the additional aspect added to impact of clinical recommendations above.</p>
<p>We know from research that adherence to exercise is the major obstacle to obtaining the benefits. Would it be reasonable to add more specifics about how to make exercise more social, gamified and interesting to address the issues identified below?</p> <p><i>"So we're trying to add in one session in a class, so it's social. And also, he'll be able to do ... they'll have machines and different props and things there that will mix it up a bit and build a bit more on his strength"</i></p>	<p>Please review the comments and consider if additional guidance should be included.</p>	<p>We have added these points to the additional point added to the "impact of clinical recommendations" above.</p>

<p><i>"One of the facilitators can be the schooling environment. If you've got the right people in the schooling environment that can help promote physical activity in a way that is enjoyable, successful, meaningful, then that means their participation in those areas can be positively influenced, rather than them sitting out on things or timekeeping or keeping score, any of those terrible things."</i> (Health Professional)</p> <p><i>"My physical activity ... is going to dance festivals where there are several DJs playing in a field or a park and just being free to dance how I want without the fear of hurting myself if I fall over and also not being judged by others who are attending."</i> (P15)</p>		
<p>Dealing with abulia and lack of initiation?</p> <p><i>"...obviously you can go to the gym and do that stuff, but again, because of my injury, I have problems with initiating. So I know it's like my start button is broken, so I know that I can do things or I know that I need to do something. I can't make myself do it."</i> (P2)"</p>	<p>Please review the comments and consider if additional guidance should be included.</p>	<p>We have added these points to the additional aspect added to the "impact of clinical recommendations" above.</p>
<p>May want to include more elements of the inclusion spectrum in the section on recreation and sport participation because I went out to the website suggested but I think it would be nice if it was easier to find. ie laying out the spectrum more specifically.</p> <p>No Modifications The sport or physical activity remains unchanged from the normal version for all participants.</p> <p>Minor Modifications Small changes are made to the normal sport or physical activity so that everyone can participate.</p> <p>Major Modifications Significant changes are made the sport or physical activity so that everyone can participate.</p> <p>Primarily for people with disability A sport or physical activity designed with the specific needs of people with disability but which allows participation of people without disability.</p> <p>Only for people with disability A sport or physical activity delivered exclusively for people with disability such as in competition.</p>	<p>Please review the comments and consider if additional guidance should be included.</p>	<p>We have included more information about the Inclusion Spectrum under the "Impact of clinical recommendation" section for clinical questions 7 and 8 in the guideline as well as defined and included the categories of the inclusion spectrum in the glossary.</p>
<p>Overall, the guidelines are some of the most rigorously developed scientifically valid GRADE guidelines in the neurorehabilitation and recovery area however they would benefit from more implementation tools to facilitate uptake and address the barriers so eloquently articulated in the qualitative study.</p>	<p>For noting.</p>	<p>Thank you for your feedback. The changes indicated above address the barriers identified by stakeholders in the qualitative studies conducted, and it is acknowledged that further work is necessary to support implementation of the guideline, for which we have a pending funding request.</p>

Public Consultation

For each intervention type (i.e., aerobic, muscle strength, gait/balance/function, sport and physical recreation, and overall physical activity promotion), the following questions were asked as prompts for feedback:

1. Do you have any concerns about the draft recommendation as we have presented it?
2. Do you have any comment on the strength (i.e., STRONG vs CONDITIONAL) of the draft recommendation?

The following general questions relevant to all physical activity intervention types were asked as prompts for further feedback:

3. Do you believe there is any high-quality evidence we have omitted that would change the recommendations?
4. Do you have any general comments for us to consider regarding the implementation of these recommendations?

Participant ID, Question No.	Public Comment	Developer Comment	Action Taken
R6, Q1 – All activity types	The draft recommendations are easy to follow and provide useful details on treatment direction and considerations for therapy. For the purpose of using this guideline to support funding recommendation to NDIS there aren't any dose specific recommendations to support therapy frequency. Often NDIS will fund the type of exercise we recommend (which again can be referenced with this guideline) however will often fall short on providing low funding due to NDIS reports of lacking research for frequency of review. It would be beneficial to have a recommendation from your research on dosage parameters within the FITT principle. NDIS understand that each individual therapy program will be tailored to their impairments and goals however, support from research would be useful. Otherwise great guideline and thank you for your efforts.	For specific dose details, including dosage parameters within the FITT principle, we have chosen to direct health professionals to the American College of Sports Medicine (ACSM) guideline for guidance. We also note the importance of not just dose in prescribing exercise in our recommendations, but also the specificity of training, the muscle groups involved etc. We agree it would be more helpful to have information on recommended training parameters and have added this detail to the guideline document.	As the ACSM guidelines are quite lengthy (and for strength training dependent on the type of muscle strength training), we have added the relevant ACSM recommendations under the "Impact of clinical recommendation" section for the aerobic and strength training clinical questions.
R12, Q1 – Aerobic training	The recommendations are excellent. One detail I'm considering as I read, is adults with chronic TBI who don't access "care" i.e., health professionals, but who still would ideally be having regular aerobic exercise. I wonder if there could be a limitation of the phrase "across the continuum of care" if they don't access services. For the point "exercise dosage is monitored (preferably using a heart rate monitor) when possible", it seems like HR monitoring would give information about intensity, rather than dosage. For the point "In the acute stage of recovery, consider mode of exercise and seek medical advice for adults with	Thank you for your considered and detailed review of the guideline. We have amended the guideline as per your suggestions.	The guideline is a clinical practice guideline, designed to support health professionals when working with people with msTBI. The term 'continuum of care' was discussed and voted on by the Guideline Development Group for the recommendations to encapsulate the various stages of recovery – from acute rehabilitation, through to home- and community-based living. Though we acknowledge your point that the phrase may be less relevant to chronic msTBI patients. When developing the recommendations, we also considered

	<p>orthopaedic injuries or craniotomy." is it too limiting to list only these two reasons to seek medical advice?</p>		<p>using the phrase ‘across the spectrum of recovery’ instead of continuum of care, though this was not supported by the Guideline Development Group.</p> <p>While heart rate monitoring is often used to provide the patient and health professional with information about intensity of effort, heart rate monitors can provide further information that reflects dosage. For example, heart rate monitors can provide information on kilocalorie expenditure, which is a function of intensity and work duration and can be used to support the dosing of high intensity short duration or low intensity long duration aerobic exercise to patients.</p> <p>We have revised the good practice points to: <i>“In the acute stage of recovery, consider mode of energetic play and/or exercise and seek medical advice prior to commencing energetic play and/or exercise for children and adolescents with additional complications such as orthopaedic injuries or craniotomy.”</i></p> <p><i>“In the acute stage of recovery, consider mode of exercise and seek medical advice prior to commencing aerobic exercise for adults with additional complications such as orthopaedic injuries or craniotomy.”</i></p>
<p>R10, Q1 – Muscle strength training</p>	<p>Comment rather than concern? Does there need to be consideration of higher reps for very weak muscles <3/5 MMT Vs >4/5 ACSM guidelines</p>	<p>For specific dose details, including the number of sets and repetitions for muscle strength training of weak muscles, we have chosen to direct health professionals to the ACSM guideline for guidance. We also note the importance of not just dose in prescribing exercise in our recommendations, but also the specificity of training, the muscle groups involved etc. We agree it would be more helpful to have information on recommended</p>	<p>As the ACSM guidelines are quite lengthy (and for strength training dependent on the type of muscle strength training), we have added the relevant ACSM recommendations under the “Impact of clinical recommendation” section for the strength training clinical questions.</p> <p>For the good practice point regarding paralysed or very weak muscles, we have added “high repetitions” in our recommendation.</p> <p><i>“For paralysed or very weak muscles, strength training is set-up to make it as easy as possible to elicit muscle</i></p>

		<p>training parameters for different types of strength training and have added this detail to the guideline document.</p> <p>As the ACSM does not cover very weak muscles, we have amended the good practice point to include guidance on repetitions.</p>	<p><i>activity (e.g., reduce friction, removing gravity, working in mid-range, electrical stimulation and/or electromyographic biofeedback) and high repetitions are encouraged."</i></p>
R12, Q1 – Muscle strength training	<p>For this point, it would be really clinically helpful if the examples for eliciting muscle activity included weight-bearing "for paralysed or very weak muscles, strength training is set-up to make it as easy as possible to elicit muscle activity (e.g., reduce friction, removing gravity, working in mid-range, electrical stimulation and/or electromyographic biofeedback)."</p> <p>For the point "muscle strength training dosage is prescribed according to American College of Sports Medicine guidelines." Presumably the guidelines list personal preferences as part of the choices of strength exercise prescription, but I don't recall it - does there need to be some reference to that.</p>	<p>Thank you for this comment. We have amended the strength training recommendation as suggested.</p>	<p>The term '<i>supported weight-bearing</i>' has been added to the list of examples of how strength training might be set up to elicit muscle activity in paralysed or very weak muscles.</p> <p><i>"For very weak muscles, strength training is set-up to make it as easy as possible to elicit muscle activity (e.g., reducing friction, reducing or removing gravity, working in mid-range, electrical stimulation and/or electromyographic biofeedback, and supported weight bearing) and high repetitions are encouraged."</i></p> <p>The ACSM guidelines do not specifically refer to personal preference as part of the prescription of exercise, but they do provide a range of modalities by which participants, in consultation with their health professional, might choose to perform their exercise using i.e., free weights, elastic bands, weight machines. No further action has been taken.</p>
R10, Q1 - Gait/balance/function training	<p>Consideration of intensity of practice</p>	<p>Thank you for this comment. Intensity of practice has been considered in the development of the guideline</p>	<p>We have added the following as a good practice point for the recommendation of gait/balance/function training for people with msTBI:</p> <p><i>"Mobility training incorporates motor learning principles of task-specific, repetitive, intensive practice."</i></p>
R12, Q1 – Gait/balance/function training	<p>This is a great point: "mobility training aims to achieve participation-level goals established collaboratively" it could be considered that mobility goals like walking into the toilet aren't directly participation goals, does activity need to be included here as well as participation. Do we not have enough evidence to include a Good Practice Point to address impairments that limit mobility, such as impaired calf power?</p>	<p>We agree that mobility goals, such as walking to the toilet, might be considered an activity-level goals.</p>	<p>We have included strength training (specifically ballistic strength training) under the strength training clinical questions to address impaired calf power to improve mobility. We have added additional information around training parameters and examples of ballistic</p>

			<p>strength exercises under “Impact of clinical recommendation” to provide further guidance.</p> <p>We have added ‘<i>activity-level goals</i>’ to the good practice point for mobility training for children and adolescence, and adults and older adults.</p>
R12, Q1 – sport & physical recreation	For this point, would it be reasonable to phrase "including supporting preparation of funding requests" so it doesn't read that the clinician should always do the whole thing? "Health professionals support the adult (including completing funding requests) to facilitate participation in sport and/or recreation, including identifying modifications, support and adaptive or specialised equipment necessary to ensure the safety and appropriateness of the activity"	We agree that the current wording might suggest the entire process of preparing funding requests rest on the shoulders of the health professional.	We have amended the statement as per the suggestion.
R10, Q3	CIMT in addition to strength training for increasing reps and improving participation goals with UL function	The purpose of developing the guideline was to support the prescription and promotion of physical activity interventions for people with moderate to severe TBI. We did not consider upper limb rehabilitation-type interventions, such as CIMT, as ‘ <i>physical activity</i> ’ interventions.	No action taken.
R5, Q4	Wording - Explore including craniectomy as many patients are awaiting bone replacement for prolonged periods	We have included a precautionary point for aerobic training for children, adolescents, adults, and older adults who have undergone, or are awaiting, craniectomy.	No action taken.
R8, Q4	I felt the document read well. It was clear which sections to go to initially access the evidence. I really liked colour coding the levels of evidence. I felt the good practice points and precautions under each recommendation were very clinically useful. I also felt the subgroup considerations are very important. It would be great if you were able to actually talk to CALD and indigenous people to get their subgroup considerations. Another subgroup I would propose would be rural and remote strategies, as access to services and transport are significantly different here. I think the plan to evaluate the guidelines is great including the core set of OE from rehabilitation facilities. Thankyou for also addressing barriers and facilitators. From the perspective of a senior PT, who covers TBI as part of a rural Community Rehab Unit (reasonably experienced but by no means an expert), thankyou for all your work. I think this will be a practical,	Thank you for the positive feedback. There is merit in including people with moderate to severe TBI living in rural and remote areas of Australia in our subgroup section. The development of this guideline has included input from services with reach into rural and remote regions of Australia, two members of our Guideline Development Group living in regional or remote Australia (a clinician and a lived	<p>We have added the following paragraph in the ‘<i>Sub-group Considerations</i>’ section of the guideline:</p> <p><i>“The development of this guideline has included input from services with reach into rural and remote regions of Australia, two members of our Guideline Development Group living in regional or remote Australia (a health professional and a lived-experience member), and some members of our stakeholder focus groups living in regional or remote Australia. Several barriers were identified through these means (e.g., social isolation and difficulty accessing services). We have not specifically focused on barriers and</i></p>

	<p>clinically useful and accessible set of guidelines that will be used a lot in practice. I also should mention the clinical unit resources and resources for barriers and implementation will be very useful. Thankyou!</p>	<p>experience member), and some members of our stakeholder focus groups living in regional or remote Australia. A few barriers were identified through these means (e.g., social isolation and difficulty accessing services). We have added rural and remote to our sub group section.</p>	<p><i>facilitators for those living in regional and remote Australia. Strategies to mitigate barriers to implementation, such as access to services and transport, are needed to ensure the recommendations presented in this guideline can be successfully implemented in rural and remote Australia. We have a funding request to seek further funding to better understand rural and remote needs as part of the implementation of the guideline. Seeking input from services accessing rural and remote Australia, and the people with msTBI living in these areas, will be critical to ensuring the relevance of the guideline to people with msTBI living in rural and remote Australia, and facilitate the implementation of the guideline in rural and remote Australia."</i></p>
R9, Q4	<p>Access to funding and supports needs to be available.</p>	<p>We agree with this comment and acknowledge the importance of access to funding and supports to implement the guideline in the 'Implementation Considerations' section of the guideline.</p>	<p>No action taken.</p>
R12, Q4	<p>The document is excellent, well done to all involved. One thought - it's impressive that the Sub-group Considerations are there and the gaps aren't masked. To interpret the guidelines, I wonder if these need to be included at the beginning, so the guidelines can be read and interpreted more practically, e.g., it appears there is nothing in the guidelines about assisted training for people who need physical help, so it may be worth declaring key evidence gaps like that at the front end.</p>	<p>The full guideline document distributed for public consultation has now been re-formatted to improve usability. As per NHMRC guidance on formatting, we have created separate administrative and technical reports with more background, logistics, and detailed methods included. We now have a main guideline document that presents the recommendations in more context for the user (i.e., health professionals working with people with msTBI). The information about sub-groups now appears prior to the recommendations. For each clinical question, the clinical need for the question and summary of evidence</p>	<p>Draft guideline document now split into three separate documents (Administrative, Technical, and Guideline) and more context is provided for each clinical question.</p>

		is presented just before the recommendations. Justification of recommendations, impact of clinical recommendation and references are included after each set of recommendations.	
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Exercise and Sports Science Australia (ESSA) – Neuro Special Interest Group review		
Reviewer Comment	Developer Comment	Action Taken
Includes considerations for the implementation, monitoring and evaluation of the Guidelines. Excellent detailing and documentation of process.	Thank you for this positive feedback.	No action taken
Wonderful to see implementation considerations, plans for updating guidelines. Very much look forward to seeing these roll out		
Under “Brain Injury rehabilitation services audit “Thank you for including exercise physiologists in your services audit!!		
Under “Methods” [edit: Section One] Given the importance of participant involvement in guidelines and the critical work done by the research team (BRIDGES qualitative research with people with TBI/ stakeholders) consider incorporating a Statement of public and participant involvement. Eg. https://www.bmj.com/sites/default/files/attachments/resources/2018/03/PPI_in_Research.pdf or using GRIPP 2 checklists https://www.equator-network.org/reporting-guidelines/gripp2-reporting-checklists-tools-to-improve-reporting-of-patient-and-public-involvement-in-research/ This would align with NHMRC guidelines on consumer and community engagement https://www.nhmrc.gov.au/about-us/consumer-and-community-involvement/consumer-and-community-engagement	We agree that a statement of public and participant involvement in Section One under the ‘Methods’ section would be appropriate.	The following paragraph outlining the involvement of patients and the public in the planning and development of the guideline has been added to section one of the guideline. <i>“People with msTBI were involved in all stages of the planning, development, and management of the guideline. Gabrielle Vassallo, a person with lived experience, was an investigator on the broader BRIDGES project, ranked the outcomes of importance and was a member of the Guideline Leadership and Development Groups. Nick Rushworth, the Chief Executive Officer of Brain Injury Australia, a national advocacy body for people with TBI, and a person with lived experience, was also a named investigator on the broader BRIDGES project. Nick was consulted prior to the Guideline Development Group meetings to discuss the involvement of people with lived experience, including himself, in the Guideline Development Groups. Qualitative consultations and stakeholder focus groups were conducted with people with msTBI to understand their preferences for, and barriers and facilitators to, physical activity. People with msTBI were also included as members of the Guideline Development Group that voted on and approved the guideline recommendations. While the Guideline was open to public consultation, it was hosted by Connectivity, a not-for-profit organisation that aims to raise awareness of brain injury in the community. We intend to disseminate the guideline to the people with msTBI directly involved in the development of the guideline initially, before disseminating it</i>

		<i>to the general public more broadly. We will seek patient and public involvement in the further dissemination of the guideline.”</i>
Inclusion of table including types of outcome measures or reference to related publication containing these data may be of use.	We have named, and for some included references to, outcome measures we recommend being used in clinical practice. Our audit identified many different measurement tools in use and our rapid systematic review on the topic (Johnson et al., 2023) identified many used in research. We believe further work is required to determine a core set of outcome measures for use in msTBI rehabilitation before putting forward a table of measures to use. This work is under consideration in our research team to help inform implementation of the guideline.	No action taken.
Under “Methods” p. 13 Consider including definitions of intervention and training types. For future researchers/ replicability, clarity on how each modality were classified would be a welcome addition. For example, ballistic training is not defined until p108 (under “additional considerations” in Table), yet evidence recommendations for this modality are strong. Similarly, definition of “task-specific mobility training” etc could be useful to include.	Definitions of the physical activity interventions considered in this guideline would be useful.	<p>We have added the following definitions to describe the physical activity interventions considered in the guideline. These are included for each clinical question in the guideline document and in the glossary section.</p> <p><i>Aerobic physical activity:</i> <i>Activity in which the body’s large muscles move in a rhythmic manner for a sustained period of time. Aerobic activity – also called endurance activity – improves cardiorespiratory fitness. Examples include walking, running, swimming, and bicycling.</i></p> <p><i>Muscle-strengthening activity:</i> <i>Physical activity and exercise that increase skeletal muscle strength, power, endurance, and mass (e.g., strength training, resistance training, or muscular strength and endurance exercises).</i></p> <p><i>Mobility training:</i> <i>Mobility is a broad term that is defined as the ability to move around and change positions, such as to stand up from sitting and to walk. Mobility exercise is practice of these tasks, e.g., sit to stand exercises, walking on a treadmill or overground, reaching in standing to challenge balance.</i></p> <p><i>Balance training:</i> <i>Static and dynamic exercises that are designed to improve an individual’s ability to withstand challenges from postural sway or destabilizing stimuli caused by self-motion, the environment, or other objects.</i></p> <p><i>Functional exercises:</i> <i>Exercises that can be embedded into everyday tasks to improve lower-body strength, balance, and motor performance. Examples include tandem and one-leg stands, squatting, chair stands, toe raises, and stepping over obstacles.</i></p>

		<p>Sport: An activity involving physical exertion, skill and/or hand-eye coordination as the primary focus of the activity, with elements of competition where rules and patterns of behaviour governing the activity exist formally through organisations.</p> <p>Physical Recreation: An activity or experience that involves varying levels of physical exertion, prowess and/or skill, which may not be the main focus of the activity and is voluntarily engaged in by an individual in leisure time for the purpose of mental and/or physical satisfaction.</p> <p>Overall physical activity promotion: Interventions that promote overall physical activity (incidental and planned), such as health coaching, pedometer programs, lifestyle/health and wellness programs.</p>
<p>Consider including a definition of “Consumers” p. 261 (document page No’s 255-257) or specifying which consumers were involved. For example, does consumer encompass clinician/client/expert/those with lived experience (p. 25 point 2 and point 4)? More specifically, the Australian Commission on Safety and Quality in Health Care has clear definition on consumers and carers https://www.safetyandquality.gov.au/sites/default/files/2020-12/11467_acsqhc_consumerguide_a4_web_fa01.pdf</p>	<p>In the current guideline, we have used the term ‘consumer’ and person with lived experience interchangeably to describe a person that has experienced a moderate to severe TBI.</p>	<p>Where appropriate, we have replaced the term ‘consumer’ with ‘person with lived experience’, except where mentioning advocacy groups or organisations that represent consumers, as defined by the Australian Commission on Safety and Quality in Health Care: “A consumer is a person who uses (or may use) a health service, or someone who provides support for a person using a health service. Consumers can be patients, carers, family members or other support people” We have added this definition to our glossary in our guideline document.</p>
<p>Under “Searching other resources” Could include statement on whether forwards and backwards citation tracking was employed. p. 14</p>	<p>Forward citation tracking was not conducted as a search strategy. Primarily because the efficiency of such a practise is questionable given the work required to conduct such a strategy and the likely limited benefits. And while backward citation tracking was not employed, we did search the reference lists of all systematic reviews identified within our search strategy.</p>	<p>No action taken.</p>
<p>Under “Data extraction...” and “... Details for synthesis” were pilot extractions completed for reliability/how were disagreements resolved? p. 16. Also on p. 16 the first statement under Data extraction and management states data extraction was completed by a single reviewer, yet under “Details of data extraction and synthesis, the statement is that two authors independently extracted data. These statements seem conflicting. Can ICCs or other measure of agreement be reported for data extraction including for piloting the data extraction tool?</p>	<p>The data extraction template used had previously been piloted and used in the Johnson et al. (2023) rapid systematic review and was again piloted by two reviewers prior to data extraction process described in the guideline. A single reviewer completed data extraction for both study details and data synthesis.</p>	<p>We have modified the text describing the data extraction process for the systematic review to reflect the process we undertook more accurately.</p>

<p>Under “Missing data” – were authors contacted prior to calculating estimates for mean/SD for graphs? P. 17</p>	<p>Authors of studies which had missing data were not contacted prior to estimating means/SD. We unfortunately did not have the time or labour required to contact the authors and request data given the timeframe and budget we were working within.</p>	<p>No action taken.</p>
<p>Recommendations from p. 27 onwards definitions for modes would be useful here as well. Especially given these guidelines are for both clinicians and individuals living with TBI.</p>	<p>We have added definitions for the physical activity intervention types in the Methods section as stated above.</p>	<p>No direct action taken to this comment, however definitions for the physical activity interventions have been added to the guideline for each clinical question and in the glossary.</p>
<p>Can citations be included in EtD frameworks? Section 3 p.44</p>	<p>Citations can, and have been, included in the EtD Frameworks.</p>	<p>We have reviewed the EtD frameworks and added further references/citations where appropriate.</p>
<p>With regards to statement “Consensus on a core set of physical outcome measures to be collected across brain injury services and within studies would improve our ability to compare results across services and studies and pool data for meta-analysis” (p.45) consider adding citation: Kirkham, J.J., Gorst, S., Altman, D.G. et al. Core Outcome Set-STandardised Protocol Items: the COS-STAP Statement. <i>Trials</i> 20, 116 (2019). https://doi.org/10.1186/s13063-019-3230-x</p> <p>These are available on the Equator Network site here: https://www.equator-network.org/reporting-guidelines/core-outcome-set-standardised-protocol-items-the-cos-stap-statement/</p>	<p>Thank you for the citation to support the statement highlighted.</p>	<p>We have added the reference suggested by the reviewer to the guideline.</p>
<p>Figure legend needed p 47. Assessment table uses slightly different reference style to body of text eg Abstract Carty et al. later first author only eg p. 49 Carty 2021</p>	<p>Thank you for drawing to our attention an inconsistency in our in-text referencing and absence of a figure legend.</p>	<p>We have reviewed the guideline and amended references where necessary to achieve consistency in formatting of the in-text references. We have also added a figure legend below the figures (copy of summary ratings on each criteria of the Evidence to Decision Framework, developed using GRADE-PRO software) for each clinical question in the Technical report.</p>
<p>Implementation considerations may benefit from reference to implementation science research development/evaluation tools. Authors may consider including recommendations for future research in this area. Guidelines for reporting implementation studies such as StaRI https://www.equator-network.org/reporting-guidelines/stari-statement/ are also available on the Equator Network site.</p>	<p>While this guideline primarily targets allied health professionals working with people with msTBI, there is scope in the ‘<i>Implementation Considerations</i>’ section of the guideline to recommend the use of implementation frameworks and evaluation tools when conducting implementation research</p>	<p>We have used implementation science frameworks for the development of the guideline, and to plan for future implementation. We have added this information to the Implementation section at the end of the guideline.</p>

	subsequent, or informed by, this guideline.	
Consider revising pagination so the 4 preceding pages which are all p(i) are consecutively numbered in roman numerals, and commence P(1) in Arabic numerals with the abstract.	Thank you for drawing the errors in pagination.	The page numbers through the guideline have been reviewed and revised.