

Accessible VR Clinical Research Toolkit

A cross-disability implementation resource for virtual reality, digital-health, behavioral, and technology-assisted clinical research

Purpose. This toolkit translates the Accessible Adaptive VR framework into practical steps, checklists, forms, and safeguards that research teams can adapt to their own protocols.

Initial implementation context: Skyward Sojourn, a virtual-reality exposure platform developed through NeuroViu. The earlier eight-participant Skyward Sojourn study established use of the underlying VR research environment; it was not designed to evaluate disability inclusion. The disability-inclusion framework described here is being piloted and refined for subsequent research.

Intended users: principal investigators, study coordinators, research assistants, accessibility leads, technology developers, facilitators, and community/lived-experience partners.

Scope: cross-disability. The framework is intended to help teams consider mobility/physical, vision, hearing, cognitive/intellectual/developmental, communication/speech, chronic illness/energy-limiting, mental-health, sensory, and multiple access needs without assuming that one accommodation works for everyone.

Important: This toolkit is research-process guidance, not medical advice and not a substitute for institutional ethics review, accessibility expertise, participant-specific clinical judgment, or applicable law/policy.

1. Accessible Adaptive VR Framework

The framework treats accessibility as a prospective research-design responsibility rather than a problem addressed only after enrollment. It can be used with immersive VR, wearables, mobile applications, remote assessments, behavioral interventions, and other technology-assisted research.

Core principles

- **Anticipate barriers:** examine study design, recruitment, consent, technology, procedures, data collection, communication, and dissemination before participants encounter them.
- **Ask rather than assume:** provide a clear process for participants to describe access needs and preferred accommodations.
- **Preserve participant control:** define pause, stop, modification, and withdrawal pathways that are easy to use during technology-assisted procedures.
- **Use lived experience:** involve people with disabilities in identifying barriers, reviewing materials, testing procedures, and improving the approach.
- **Interpret behavior cautiously:** do not automatically assign psychological meaning to movement, posture, response speed, gaze, speech, or interaction patterns that may reflect disability or assistive-technology use.
- **Document and improve:** convert recurring barriers and participant feedback into lasting protocol, technology, and training changes.

Research-lifecycle workflow

Stage	Accessibility action
Design / co-design	Identify foreseeable barriers; review inclusion/exclusion criteria; obtain lived-experience input; define modifiable and non-modifiable protocol elements.
Recruitment / screening	Use accessible outreach; provide an accommodation contact pathway; avoid treating accommodation needs as automatic exclusions.
Consent	Offer accessible formats and communication methods; confirm understanding using methods appropriate to the participant and protocol.
Study preparation	Create an individualized accommodation plan; test equipment and alternative interaction options before data collection when feasible.
Participation	Use participant-controlled pause/stop pathways; document accommodations and access barriers; permit scientifically appropriate modifications.
Data interpretation	Consider disability, assistive-device use, positioning, sensory or motor differences, and participant report before interpreting behavioral signals.
Follow-up / dissemination	Ask about accessibility experience; document improvements; communicate results in accessible formats where feasible.

2. Accessibility Planning Checklist

Use during protocol development and again before enrollment. Mark Yes, No, Not Applicable, or Needs Review and record an action owner.

Study design and eligibility

■ Yes ■ No ■ N/A ■ Needs Review

Have inclusion and exclusion criteria been reviewed for requirements that may unnecessarily exclude people with disabilities?

■ Yes ■ No ■ N/A ■ Needs Review

Can scientifically nonessential positioning, movement, response-speed, or technology-use requirements be modified?

■ Yes ■ No ■ N/A ■ Needs Review

Have foreseeable accessibility barriers been discussed with people who have relevant lived experience?

Recruitment and communication

■ Yes ■ No ■ N/A ■ Needs Review

Are recruitment materials available in accessible digital formats?

■ Yes ■ No ■ N/A ■ Needs Review

Is there a clear way to request accommodations before screening or a study visit?

■ Yes ■ No ■ N/A ■ Needs Review

Can study staff communicate through more than one method when appropriate?

Consent and participant information

■ Yes ■ No ■ N/A ■ Needs Review

Can consent materials be provided in accessible electronic or alternative formats when needed?

■ Yes ■ No ■ N/A ■ Needs Review

Is sufficient time available for questions, communication support, or comprehension needs?

■ Yes ■ No ■ N/A ■ Needs Review

Are participants told how to pause, modify, or stop procedures and how withdrawal works?

Technology and physical setup

■ Yes ■ No ■ N/A ■ Needs Review

Can the participant use the study technology from an appropriate seated, standing, or otherwise supported position when scientifically feasible?

■ Yes ■ No ■ N/A ■ Needs Review

Have headset/controller fit, reach, input method, visual presentation, audio, sensory intensity, and physical navigation demands been reviewed?

■ Yes ■ No ■ N/A ■ Needs Review

Can assistive devices remain available unless their use would create a documented safety or scientific conflict?

■ Yes ■ No ■ N/A ■ Needs Review

Is there a plan for cybersickness, fatigue, sensory overload, pain, or other access-related discomfort?

Data collection and interpretation

■ Yes ■ No ■ N/A ■ Needs Review

Are accommodation-related protocol deviations or modifications documented?

■ Yes ■ No ■ N/A ■ Needs Review

Are behavioral measures interpreted with disability-related confounders in mind?

■ Yes ■ No ■ N/A ■ Needs Review

Can participant-reported context be recorded alongside technology-derived measures?

■ Yes ■ No ■ N/A ■ Needs Review

Are missing data and noncompletion examined for accessibility-related causes rather than treated only as participant failure?

3. Participant Accommodation Planning Form

Use this form to plan access needs without requiring a participant to disclose more disability information than is necessary for the research procedure.

Participant / study ID	_____
Preferred communication method(s)	_____
Study activity or technology involved	_____
Access need or barrier identified	_____ _____
Accommodation requested or proposed	_____ _____
Participant preference / comments	_____ _____
Safety or protocol considerations	_____ _____
Accommodation agreed	_____
Responsible team member	_____
Date to review / test	_____

Participant-control check: Before beginning, confirm how the participant can request a pause, modification, assistance, or stop. Do not make continued participation contingent on tolerating avoidable access barriers.

4. Accessible Consent and Communication Checklist

- Use plain, direct language appropriate to the study population while preserving required consent information.
- Provide accessible electronic documents and compatible formats when feasible; avoid image-only documents for essential participant information.
- Ask about communication preferences rather than inferring them from a diagnosis or disability.
- Allow additional processing or response time when appropriate.
- Provide a method for questions before and during participation.
- Explain technology demands, physical positioning, sensory features, foreseeable discomforts, and available modifications before the procedure begins.
- Explain that requesting an accommodation does not by itself require withdrawal or exclusion; determine whether a requested modification is compatible with safety and scientific integrity.
- Make pause, stop, modification, and withdrawal procedures explicit and easy to initiate.
- When a support person, interpreter, communication aid, or assistive technology is involved, document roles and any implications for the research procedure.
- Confirm understanding using an approach appropriate to the participant and the approved protocol.

Suggested participant-facing accessibility question

“Is there anything about the study information, communication, physical setup, technology, timing, sensory environment, or research procedure that we can adjust to make participation more accessible to you?”

5. Participant Pause / Stop / Modification Procedure

This procedure is intended for immersive or technology-assisted sessions where a participant may need rapid control over the research experience.

Step	Procedure
Before the session	Explain the pause/stop method verbally and in accessible written form. Agree on any additional signal the participant can use if speech or controller input becomes difficult.
During the session	Respond promptly to the agreed signal. Pause technology or the procedure when feasible and establish whether the participant wants assistance, a modification, a break, or to stop.
Modification	If the participant wishes to continue, implement a scientifically and ethically appropriate accommodation. Record what changed and whether the change affects interpretation of study data.
Stopping / withdrawal	Follow the approved protocol and consent process. Do not pressure the participant to continue. Document the reason only to the extent permitted and necessary.
After the event	Ask whether the accommodation or response was adequate. Record any recurring barrier that should result in a protocol, technology, or staff-training change.

6. Barrier → Accommodation → Participant Response → Design Modification Log

Use one row per barrier or access issue. The purpose is to turn individual accessibility experiences into traceable research improvements.

Barrier identified	Accommodation / action	Participant response	Design / protocol modification	Status
_____	_____	_____	_____	■ One-time ■ Adopted ■ Review
_____	_____	_____	_____	■ One-time ■ Adopted ■ Review
_____	_____	_____	_____	■ One-time ■ Adopted ■ Review
_____	_____	_____	_____	■ One-time ■ Adopted ■ Review

Recommended implementation measures: number and type of barriers identified; accommodations requested, offered, accepted, and successfully implemented; procedure completion with accommodations; access-related withdrawals/noncompletion; participant accessibility feedback; and permanent study or technology changes resulting from lived-experience input.

7. Behavioral Data Interpretation Safeguards

Technology-assisted studies may generate behavioral measures that appear objective but can be affected by disability, assistive technology, positioning, fatigue, sensory access, or individual interaction style. These safeguards are intended to reduce inappropriate inference.

Observed measure	Do not automatically infer	Consider / document
Slower approach or movement	Fear, avoidance, low motivation	Mobility, balance, pain, fatigue, assistive-device use, unfamiliarity, chosen pacing
Postural sway or instability	Anxiety or distress	Balance differences, vestibular factors, stance, physical support, equipment fit
Longer response time	Confusion or disengagement	Processing time, motor response, communication method, device accessibility
Reduced gaze / head movement	Low attention	Visual access, neck mobility, sensory regulation, headset fit, interaction strategy
Speech differences / limited verbal response	Low understanding	Communication disability, speech access, AAC use, fatigue, preferred response mode
Early pause / session modification	Treatment failure	Accessibility need, sensory load, pain, fatigue, technology fit, participant self-advocacy

Safeguard rule: When a behavioral signal may have more than one plausible explanation, combine it with participant-reported context and other appropriate measures rather than assigning a disability-insensitive interpretation from the signal alone.

8. Lived-Experience Co-Design Guide

Meaningful engagement should influence decisions, not simply confirm decisions already made. Research teams can adapt the following process to the scope and stage of their project.

- **Define the decision:** identify what participants or community partners can meaningfully influence, such as recruitment language, consent, device interaction, sensory settings, physical setup, outcome selection, or interpretation.
- **Recruit relevant perspectives:** seek people whose access needs relate to the study demands. Avoid assuming one person represents an entire disability community.
- **Make engagement accessible:** ask about communication, scheduling, format, technology, sensory, mobility, and other participation needs.
- **Compensate when feasible and appropriate:** plan compensation for lived-experience expertise consistent with institutional and funding requirements.
- **Document influence:** record recommendations, decisions, modifications, and reasons when a recommendation cannot be adopted.
- **Close the feedback loop:** tell contributors what changed because of their input and what remains under review.

Co-design record

Question	Record
Who was engaged and what relevant access perspectives were represented?	
What study decision(s) could they influence?	
What barriers or recommendations were identified?	
What changed because of the input?	
What was not changed, and why?	
How was the feedback loop closed?	

9. Implementation and Adaptation Guide

The toolkit is intentionally platform-independent. A research team may adopt the entire framework or individual components without using NeuroViu technology or Skyward Sojourn.

Minimum implementation set

- Assign a team member responsible for accessibility planning and escalation.
- Complete the Accessibility Planning Checklist during protocol development.
- Provide an accommodation-request pathway before participation.
- Use the Participant Accommodation Planning Form when an access need is identified.
- Train staff on the Pause / Stop / Modification Procedure.
- Use the Barrier → Accommodation → Participant Response → Design Modification Log.
- Apply the Behavioral Data Interpretation Safeguards during analysis and interpretation.
- Review accessibility feedback at defined intervals and convert recurring issues into permanent improvements.

Adaptation questions

- Which study requirements are scientifically essential, and which can be modified?
- Which disability-related access needs are most relevant to the technology and procedures?
- What alternative input, positioning, communication, or sensory options can be supported?
- What accommodations could affect measurement and therefore need to be documented analytically?
- How will participants and lived-experience contributors learn what changed because of their feedback?
- How will the team measure whether accessibility practices improve participation or experience?

Suggested evaluation indicators

- Recruitment: accessibility inquiries, accommodation requests, and screening exclusions related to access.
- Accommodation: requests received, accommodations offered/implemented, unresolved barriers.
- Participation: completion with accommodations, pauses/modifications, access-related noncompletion.
- Experience: participant-reported accessibility, usability, comfort, communication, and perceived control.
- Improvement: protocol, technology, training, or material changes resulting from participant/lived-experience input.
- Sustainability: toolkit components incorporated into standard protocols, onboarding, or recurring research workflows.

10. Skyward Sojourn Implementation Context

Skyward Sojourn is the initial VR research environment informing development of Accessible Adaptive VR. In the preliminary study, eight adults who reported fear of heights completed a single 35-45 minute immersive exposure session with participant-paced progression and facilitator support. Self-reported distress was collected during the procedure, and mean pre-session SUDS was 70.51 compared with 35.19 after the session.

These preliminary findings demonstrate implementation of the underlying VR environment, but they do not establish the effectiveness of the disability-inclusion framework. Disability status, accessibility barriers, and accommodations were not systematically documented in that study. The inclusion framework is being piloted and refined for subsequent research, where accessibility barriers, accommodations, participant responses, and resulting modifications can be documented prospectively.

The framework also reflects an important methodological safeguard identified for future technology-assisted research: behavioral signals such as slower approach, postural sway, or use of physical supports should not automatically be interpreted as fear because mobility, balance, motor differences, assistive-device use, and individual movement patterns may produce similar observations.

Future human-participant research using this framework should proceed under appropriate ethics review and applicable institutional requirements before enrollment.

Resource maintenance

This toolkit is intended to be updated as additional barriers, accommodations, lived-experience feedback, and implementation lessons are documented. Research teams adapting the resource should retain the core principles of prospective accessibility planning, participant control, lived-experience engagement, contextual data interpretation, and traceable improvement.

Prepared as a public-facing implementation resource for the Accessible Adaptive VR disability-inclusion approach.