

Behavioral Data Interpretation Safeguards

Best-Practice Guide | Accessible Adaptive VR | NeuroViu

Purpose. This guide helps investigators avoid assigning unsupported psychological or clinical meaning to technology-derived behavior when disability, accessibility, assistive-device use, fatigue, sensory processing, communication, motor function, or study context may provide alternative explanations.

Core rule: A behavioral signal is an observation, not a diagnosis. Interpret behavior using participant-reported context, known study conditions, accommodation records, and multiple converging measures whenever possible.

1. Why This Safeguard Matters

VR, wearables, motion tracking, eye tracking, mobile applications, and behavioral tasks can produce precise measurements while still supporting an incorrect interpretation. A slower approach, greater sway, delayed response, reduced gaze, pause, or use of physical support may be relevant to an outcome, but the same observation can also reflect mobility, balance, sensory, communication, fatigue, interface, equipment, or accommodation factors.

Disability-inclusive analysis therefore separates **what was measured** from **what the researcher believes it means**.

2. Interpretation Safeguard Table

Observed signal	Do not automatically infer	Consider before interpretation
Slower approach / movement	Fear, avoidance, low motivation	Mobility, balance, pain, fatigue, assistive-device use, cautious navigation, unfamiliar interface
Postural sway / instability	Anxiety or heightened arousal	Baseline balance, vestibular or motor differences, stance, footwear, support use, equipment setup
Hesitation / pauses	Fear, disengagement, treatment resistance	Processing time, fatigue, sensory load, communication needs, navigation uncertainty, accessibility barrier
Gaze differences	Avoidance, inattention, low engagement	Vision, eye-movement differences, display access, positioning, sensory strategy, task comprehension
Longer response time	Confusion, low attention, impairment	Motor response, communication method, cognitive processing time, interface accessibility, fatigue
Use of railing / physical support	Fear or dependence	Balance, mobility strategy, pain, safety preference, habitual support use
Reduced speech / atypical speech pattern	Distress, disengagement, poor understanding	Communication disability, speech difference, AAC use, processing time, participant preference
Stopping or requesting a break	Treatment failure or noncompliance	Access barrier, fatigue, pain, sensory load, equipment discomfort, need for modification, participant choice

3. Six-Step Interpretation Check

- 1. Describe the observation.** Record the measured behavior without embedding an interpretation. Example: “approach speed decreased,” rather than “fear increased.”
- 2. Check participant context.** Review relevant participant-reported experience, access needs, accommodations, and baseline behavior without requiring unnecessary diagnostic disclosure.
- 3. Check study context.** Consider equipment fit, interface accessibility, environmental conditions, task instructions, sensory intensity, positioning, fatigue, and technical problems.
- 4. Identify plausible alternatives.** Explicitly document disability-, access-, technology-, and context-related explanations that could produce the same signal.
- 5. Seek converging evidence.** When the research question permits, interpret behavior alongside participant report and other validated measures rather than relying on a single behavioral proxy.
- 6. Qualify the conclusion.** Report uncertainty and avoid stronger psychological or clinical claims than the data support.

4. Documentation Template

For important behavioral signals, research teams can document the interpretation pathway using the following structure.

Field	What to record
Observed behavior	Objective description of the signal or event.
Initial analytic hypothesis	The construct the study intended the measure to represent.
Accessibility/context alternatives	Other plausible explanations related to access, disability, technology, environment, or accommodation.
Participant-reported context	Relevant feedback volunteered or collected through approved study procedures.
Converging evidence	Other measures that support, contradict, or leave the interpretation uncertain.
Final interpretation	Qualified conclusion and remaining uncertainty.

5. Recommended Reporting Language

Prefer: “Participants differed in approach speed. Because approach speed may also be influenced by mobility, balance, assistive-device use, familiarity with the interface, and other contextual factors, the measure was not interpreted as a standalone indicator of fear.”

Avoid: Statements that equate a single movement, gaze, speech, response-time, or support-use measure with fear, anxiety, attention, understanding, motivation, or treatment response without adequate validation and contextual evidence.

6. Integration With the Accessible Adaptive VR Framework

Use this guide alongside the Accommodation Planning Form and Participant Pause, Stop, and Modification Procedure. When an access barrier or accommodation could influence a behavioral measure, record that context and consider it during analysis. Recurring interpretation problems should feed back into the **Barrier -> Accommodation -> Participant Response -> Design Modification** process.

Scope note. These safeguards are best-practice guidance, not a substitute for validated measurement models, statistical analysis plans, clinical assessment, accessibility expertise, or ethics review. They are designed to improve transparency and reduce unsupported interpretation in disability-inclusive research.