User Manual: AI-Driven Personalized Treatment Pathway Engine

사용자 매뉴얼: AI 기반 개인 맞춤형 치료 경로 엔진

Clinician, Developer, and Patient Guides
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Overview

Who This Manual Is For

This manual covers the use of the AI-Driven Personalized Treatment Pathway Engine deployed within the NeuroCatchers platform. It is divided into three parts: Part I (Clinician Guide), Part II (Developer Guide), and Part III (Patient / Self-Use Guide). Each part is self-contained, and you can read the part most relevant to your role.

System at a Glance

The platform consists of two complementary modules. NeuroCatchers (Diagnostic Module) provides structured assessment, the recommendation engine, session planning, and audit-traceable reasoning. TalkCatcher (Treatment Module) provides conversational AI bots for ten symptom domains: ADHD, depression, anxiety, sleep, burnout, post-traumatic stress disorder, obsessive-compulsive disorder, bipolar disorder, autism, and peak performance.

The two modules are connected by a privacy-preserving opt-in bridge. By default, conversational data does not flow into the clinical record. The patient may explicitly enable synchronization at any time, and may withdraw consent at any time.

The Six Algorithms

ALG-1 (Recommendation Engine) takes a unified patient profile and produces ranked treatment recommendations with reasoning. ALG-2 (Session Plan Generator) takes a selected training and produces an N-session plan with developmental progression. ALG-3 (Adaptive Replan) updates the plan in response to changes. ALG-4 (Bot↔Catcher Bridge) governs privacy-preserving synchronization. ALG-5 (Custom Training Builder) lets clinicians or patients add new trainings to the library. ALG-6 (Bilingual Result Renderer) produces Korean and English versions of every diagnostic output.

Conventions Used in This Manual

Tables marked CLINICIAN are intended for clinician readers; DEVELOPER for developers; PATIENT for end users. Korean text appears below the English text in each section.

Part I. Clinician Guide

Chapter 1. Entering a New Patient

To begin work with a new patient, navigate to the NeuroCatchers dashboard and select 'New Patient.' Required fields include name (or pseudonym), age, primary language preference (Korean or English), and two consent flags: consent_research and consent_bot_sync. The bot synchronization flag defaults to OFF and may be changed by the patient at any time; it should never be set to ON without explicit patient consent.

The patient record is created in the patients table. From there, you can proceed to symptom assessment.

Chapter 2. Conducting a Symptom Assessment

Open the Symptom Catcher and complete the integrated assessment. The system invokes the Fingerprint Engine, Five-Lens analysis, and the Differential Mental Disorder Algorithm (DMDA). These run in parallel and produce a Consensus diagnostic profile that combines symptom self-report, biomarker data (where available), and differential pattern matching.

The output is rendered in two versions by ALG-6: a Clinician version with full DSM-5-TR / ICD-11 references and Z-scores, and a Patient version using everyday language and metaphor. Both versions are available in Korean and English simultaneously.

After the assessment, the patient_profile_unified table is populated with the synthesized profile that serves as input to recommendation.

Chapter 3. Receiving and Interpreting Recommendations

Click 'Get Recommendations' to invoke ALG-1. Within seconds, you will see a ranked list (1, 2, 3 by default; up to 5 if requested) of training recommendations from the training_library, each with a composite_score between 0 and 1, score_components (the six sub-scores), and human-readable reasoning_ko / reasoning_en text.

Each recommendation displays:

• Training name and brief description

• Composite score (rounded to two decimals)

• Top contributing score components

• Reasoning text (KO and EN)

• Evidence citations (PMID/DOI hyperlinks)

• Contraindications considered (and outcome)

The recommendation is for your clinical judgment to accept, modify, or reject. Selecting 'Accept' proceeds to session planning. Selecting 'Modify' allows you to override the choice with a different

training from the library. Selecting 'Reject' records your reason and prompts ALG-1 to produce a new ranked list excluding the rejected option.

Chapter 4. Session Plan and Per-Session Workflow

After acceptance, ALG-2 generates a session plan. The default for ADHD is 12 sessions; this is configurable (recommended range: 6-24). The plan displays each session's Fischer skill level target, activity focus, and quick_input fields for pre-session and post-session entry.

Each session entry takes approximately 30 seconds: before the session, the patient (or you with the patient) enters a small number of pre-session values (e.g., mood 0-10, focus 0-10); after the session, the same fields plus task-specific outcomes are entered. These entries populate session_records and serve as input to ALG-3 if replanning is triggered.

Chapter 5. Adaptive Replanning

ALG-3 is triggered automatically when any of three conditions occur: the patient requests a change in session count or goal; quick_input scores show consistent regression over three or more sessions; or the patient signals dropout intent. You may also manually trigger replanning from the patient dashboard.

Replanning produces a diff against the original plan and preserves the original in plan_modifications history. The reasoning for the change is documented in reasoning_ko / reasoning_en and appended to the audit trail.

Chapter 6. Bot-Bridge Use (Patient Has Enabled Sync)

If the patient has set consent_bot_sync to ON, ALG-4 will write bot_summary entries into session_records. As a clinician, you can view these summaries from the patient dashboard. The summary schema is fixed: mood_trend, reported_symptoms (extracted from conversation), life_events, adherence_self_report, and a brief narrative summary in both languages.

Importantly, the raw conversation log is never visible to you, only the structured summary. If the patient withdraws consent, all bot_summary entries created during the consent period remain in the record but no new entries are added.

Chapter 7. Authoring a Custom Training (ALG-5)

You can add new trainings to the training_library via the Custom Training Builder. From the dashboard, select 'Create Custom Training' and fill the eight dropdown fields: symptom track, primary modality, target behavior, recommended session count, recommended duration per session, evidence_level (always 'custom' for clinician-authored), quick_input_schema (selected from preset options), and contraindications (selected from a checklist).

The AI assistant will draft the description and contraindication text in both languages for your review. After approval, the new training appears in ALG-1's candidate pool for future recommendations.

Chapter 8. Audit Trail Access

Every recommendation produced for any patient is auditable. Navigate to Admin → Audit and search by patient_id, date range, or model_version. Each entry shows the full score_components, evidence_citations, reasoning text in both languages, and the model_version that produced it. This view supports clinical review, quality improvement, and regulatory audit.

Part II. Developer Guide

Chapter 9. Database Setup

The system runs on PostgreSQL via Supabase. The schema comprises six core tables: patients, symptom_assessments, patient_profile_unified, training_library, training_plan_recommendations, and session_records. JSONB columns are used extensively for flexible structured data (score_components, evidence_citations, quick_input_schema, bot_summary).

Migration files are located in /db/migrations/. To set up a new environment, run migrations sequentially. Row-Level Security (RLS) policies enforce that clinicians see only their own patients and that patients see only their own records.

Chapter 10. ALG-1 Recommendation Engine Integration

ALG-1 is invoked via a single function call: recommend(patient_profile_unified_id, n_recommendations=3, exclude=[]). The function returns an array of recommendation objects, each containing training_id, rank, composite_score, score_components, reasoning_ko, reasoning_en, evidence_citations, and contraindications_considered.

All component weights and scoring methods are configured in /config/scoring_config.json. The model_version identifier is incremented when this config changes; historical recommendations remain traceable to the model that produced them.

Chapter 11. ALG-2 / ALG-3 Session Plan APIs

ALG-2 is invoked via generate_session_plan(training_id, n_sessions, fischer_level_estimate). It returns an array of session_record skeletons with per-session Fischer level target, activity focus tags, and quick_input field definitions.

ALG-3 is invoked via replan(session_record_id, trigger_reason). Trigger reasons are: 'session_count_change', 'goal_modification', 'regression_detected', 'dropout_intent', 'manual'. The function returns a diff against the original plan and writes to plan_modifications.

Chapter 12. ALG-4 Bot-Catcher Bridge

ALG-4 listens to bot conversation_end events. Before processing, it checks consent_bot_sync. If FALSE, it discards the event. If TRUE, it invokes the summary extraction pipeline: retrieval-augmented generation against a curated clinical vocabulary, schema-constrained extraction conforming to bot_summary, and writes to session_records.bot_summary.

The raw conversation log is never persisted in the diagnostic record. Only the structured summary is transferred. This minimizes data flow consistent with GDPR Article 5(1)(c) data minimization.

Chapter 13. ALG-5 Custom Training Builder API

Custom training authoring proceeds via a guided wizard that maps eight UI fields to a training_library row with evidence_level='custom' and source set to the authoring clinician's identifier. AI assistance generates description_en, description_ko, and contraindications text from the input fields; the human author reviews and edits before saving.

Validation rules enforce that the symptom_track is recognized, the modality is one of the seven canonical types, the quick_input_schema validates against the canonical schema specification, and at least one contraindication has been considered (even if 'none applicable').

Chapter 14. Audit Layer Integration

Every ALG-1 invocation writes one row per recommendation to training_plan_recommendations. The score_components JSONB column contains the full decomposition with sub-component values and computation methods. The evidence_citations JSONB array contains PMID/DOI strings with claim text and component link.

model_version is a string identifier (e.g., 'alg1-v1.2.0-prod') incremented on any change to scoring weights, sub-component methods, or training_library content. Historical interpretability is preserved by retaining all model_version values and allowing replay against the recorded model.

Chapter 15. Deployment and Monitoring

The platform is deployed via GitHub Actions to AWS S3 + CloudFront. The frontend is static HTML/JS with bilingual rendering performed by BNMI18n (a lightweight client-side translation system). The backend recommendation engine is invoked via Supabase RPC calls.

Monitoring covers: recommendation latency (target p95 < 2s), recommendation acceptance rate, replan trigger frequency by reason, bot_summary write rate (proportional to consent_bot_sync=TRUE patients), and audit log integrity check (no missing model_version values).

Part III. Patient Guide

Chapter 16. Welcome

This guide is for you, the user. Whether you are using NeuroCatchers under the care of a clinician or working with it on your own, the same principles apply: this system is a partner to your own self-understanding, not a replacement for professional care when you need it.

The system speaks both Korean and English. You can switch languages at any time using the toggle in the upper right of every page.

Chapter 17. Your First Visit: The Symptom Catcher

Start with the Symptom Catcher. This is a structured questionnaire that takes about 15-20 minutes. You will be asked about a range of mental health and well-being topics. Answer as honestly as you can; the system uses your responses to suggest where to focus.

At the end, you will see two versions of your results. The 'Patient view' uses everyday language and metaphors to explain what the assessment suggests. The 'Clinician view' uses professional terminology; this is useful if you plan to share results with a clinician.

Chapter 18. Entering a Specific Catcher

Based on your assessment, you may be guided to a specific Catcher (e.g., ADHD Catcher, Depression Catcher). Each Catcher contains tools and training options specific to that area. You can also enter any Catcher directly without first completing the Symptom Catcher if you already know what you want to work on.

Chapter 19. Receiving Personalized Recommendations

Inside a Catcher, click 'Get Recommendations.' The system will show you the top three suggested training paths, each with a short explanation of why it was suggested for you. You will see:

• The training name and what it involves

• A short paragraph explaining the recommendation

• Estimated number of sessions and time per session

• Any cautions specific to your situation

You are free to choose any of the three suggestions, or to ask for more options. Your choice is recorded so the system can learn what works for you over time.

Chapter 20. Doing Sessions

Each training has a planned sequence of sessions (often 8-16, depending on the training). Each session has a short check-in before you start (less than a minute) and a short check-out after (also less than a minute). The check-ins help you and the system track how you are doing.

You can pause or stop any time. You can also change your goal, your session count, or even your training. The system will adjust the rest of the plan accordingly.

Chapter 21. The Conversational Bot (TalkCatcher)

TalkCatcher is a separate part of the platform where you can have open conversations with an AI companion specific to your symptom area. Your conversations there are private by default — they do not flow into your clinical record.

If you wish, you can choose to share a summary (not the full conversation, just a summary) of your bot interactions with your NeuroCatchers record. This helps if you are working with a clinician and want them to have context, or if you want the recommendation engine to learn from your bot use. You can turn this on or off at any time.

Chapter 22. Privacy and Your Data

Several aspects of how we handle your data are worth knowing. First, you are the owner of your data. You can export, download, or delete your records at any time. Second, by default, bot conversations and clinical records are kept separate; you must explicitly opt in to share between them. Third, every recommendation made for you is recorded with the reasoning, so you (or a clinician you choose) can review why a suggestion was made.

If you ever want to know why a particular recommendation was made, ask. The system will show you the score components, the evidence sources, and the contraindications it considered.

Chapter 23. When to See a Professional

This system is a useful tool, but it is not a substitute for professional care in situations of crisis or severe distress. If you are experiencing thoughts of self-harm, severe depression, panic, or any condition that feels beyond what you can manage alone, please reach out to a qualified mental health professional or, in an emergency, call your local crisis line. The system will not replace this kind of care.