

NeuroBreath.co.uk — Project Documentation

Version: 1.0.0

Last Updated: December 23, 2025

Project Status: Active Development

Project Mission

NeuroBreath.co.uk is a comprehensive digital platform providing evidence-based breathing exercises, mindfulness tools, and specialized learning interventions for neurodivergent individuals, with a particular focus on:

- **ADHD** — Attention regulation and focus enhancement
 - **Anxiety & Stress** — Nervous system regulation and emotional well-being
 - **Dyslexia** — Structured literacy and reading skill development
 - **Autism** — Sensory regulation and self-soothing techniques
 - **Sleep** — Sleep hygiene and relaxation protocols
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Core Aims

1. Accessibility First

- Ensure all features are usable by individuals with diverse learning needs and abilities
- Maintain WCAG 2.1 AA compliance across all pages
- Provide multiple modalities of interaction (visual, auditory, kinesthetic)
- Support screen readers, keyboard navigation, and assistive technologies

2. Evidence-Based Practice

- Ground all interventions in peer-reviewed research and clinical guidelines
- Cite authoritative sources (IDA, Harvard, NHS, Yale, etc.)
- Provide transparent explanations of why each technique works
- Update content based on latest scientific findings

3. Neurodivergent-Centered Design

- Design for focus, reduced cognitive load, and sensory comfort
- Avoid overwhelming interfaces with excessive stimuli
- Provide clear visual hierarchies and predictable navigation
- Offer customization options (ambient sounds, voice coach, time settings)

4. Practical & Actionable

- Provide immediately usable tools and exercises
- Break complex skills into manageable steps
- Track progress to maintain motivation
- Offer downloadable resources for offline use

5. Inclusive & Stigma-Free

- Use person-first and identity-first language respectfully
 - Celebrate neurodiversity as natural human variation
 - Avoid deficit-focused framing
 - Provide tools for all ages and skill levels
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Design Principles

Visual Design

- **Color Palette:**
 - Primary: Purple/Indigo (#4F46E5, #7C3AED) — Calming and focused
 - Accent: Cyan (#06B6D4), Green (#10B981), Blue (#3B82F6)
 - Backgrounds: Soft gradients (purple-50 to pink-50, blue-50 to cyan-50)
 - Text: High contrast (gray-900 on white, white on dark)
- **Typography:**
 - Sans-serif fonts for readability (system fonts: Arial, Helvetica)
 - Comic Sans MS for child-friendly worksheets
 - Minimum 16px body text, 18-24px headings
- **Spacing:**
 - Generous whitespace to reduce cognitive load
 - Consistent padding (p-4, p-6, p-8)
 - Clear visual grouping with cards and sections
- **Icons & Emojis:**
 - Use emojis for visual interest and quick recognition (🫁 lungs, 📚 books, 🎵 music)
 - Lucide icons for UI controls (consistent 24px size)

User Experience

- **Navigation:**
 - Sticky header with clear menu structure
 - Conditions menu (ADHD, Anxiety, Dyslexia, Autism, Sleep, Stress)
 - Breathing techniques menu (4-7-8, Box, Coherent, SOS)
 - Tools menu (Breath Ladder, Colour Path, Focus Tiles, Roulette)
- **Interaction Patterns:**
 - Large tap targets (minimum 44×44px)
 - Immediate visual feedback on all interactions
 - Toast notifications for actions (downloads, completions)
 - Confetti celebrations for milestones
- **Progress Tracking:**
 - LocalStorage for client-side persistence
 - Visual progress bars and percentage displays
 - Streak tracking and achievement badges
 - Mastery indicators for completed skills

Technical Standards

- **Framework:** Next.js 14.2.28 (App Router)
- **Language:** TypeScript with strict mode
- **Styling:** Tailwind CSS with custom utilities
- **UI Components:** Radix UI primitives + shadcn/ui
- **State Management:** React hooks (useState, useEffect, useRef)
- **Audio:** Web Audio API for synthesis, HTML5 Audio for playback
- **Storage:** LocalStorage for client-side persistence
- **Package Manager:** Yarn (default and only)

Objectives by Focus Area

Dyslexia Reading Training

Primary Goal: Provide a comprehensive structured literacy hub covering all 6 elements (Phonology, Sound-Symbol, Syllable, Morphology, Syntax, Semantics)

Objectives:

1. **Phonological Awareness** (3+ games)
 - Blending & Segmenting Lab ✓
 - Rhythm Training Game ✓
 - Letter Reversal Training ✓
 - Syllable Splitter ✓
 - Phonics Sounds Lab ✓
1. **Decoding & Word Recognition** (8+ tools)
 - Phonics Player ✓
 - Word Construction (drag-and-drop) ✓
 - Rapid Naming Test ✓
 - Morphology Master ✓
 - Vowel Universe ✓
2. **Fluency Development** (2+ tools)
 - Fluency Pacer with WPM tracking ✓
 - Reading Assessment ✓
3. **Vocabulary & Comprehension** (2+ tools)
 - Vocabulary Recognition (flashcards) ✓
 - Vocabulary Builder ✓
4. **Resources & Support** (5+ downloads)
 - Parent & Educator Guide ✓
 - Weekly Progress Tracker ✓
 - Phonics Worksheets ✓
 - Letter Reversal Practice ✓
 - Achievement Certificates ✓
5. **Gamification** (ongoing)
 - Streak Toolkit ✓

- Reward Cards System ✓
- Reading Buddy Chatbot ✓

Success Metrics:

- 28+ interactive components
- 137 KB optimized page size
- Zero broken links
- LocalStorage persistence across all tools
- Evidence banners on all game components

Breathing Techniques

Primary Goal: Provide scientifically-backed breathing protocols for nervous system regulation

Objectives:

1. Core Techniques (4 protocols)

- 4-7-8 Breathing (sleep & anxiety) ✓
- Box Breathing (focus & calm) ✓
- Coherent Breathing (HRV optimization) ✓
- SOS Breathing (acute stress) ✓

1. Enhanced Features

- Fullscreen immersive mode ✓
- Voice coach with TTS ✓
- Ambient sounds (6 options) ✓
- Time selection (1-10 minutes) ✓
- Driving safety warnings ✓

2. Progress Tracking

- Session counting ✓
- Total minutes practiced ✓
- Streak tracking ✓
- Badge achievements ✓

Tools & Games

Primary Goal: Provide engaging tools for skill-building and regulation

Objectives:

1. **Breath Ladder** — Progressive difficulty breathing challenges
2. **Colour Path** — Visual focus and attention training
3. **Focus Tiles** — Memory and concentration games
4. **Roulette** — Random technique selector for variety

Global Features

Primary Goal: Provide consistent support across all pages

Objectives:

1. **Reading Buddy Chatbot** ✓
- Floating button in bottom-right corner
 - Green gradient with red notification badge
 - 15+ predefined responses

- Custom query handling
- Available on all pages via layout

1. **Progress System** ✓

- Centralized progress tracking
- Badge unlocking system
- Challenge completions
- Quest rewards

2. **Rewards Page** ✓

- Achievement cards display
 - Progress visualization
 - Motivational messaging
-

Technical Architecture

Project Structure

```

neurobreath/
├── nextjs_space/
│   ├── app/
│   │   ├── layout.tsx          # Global layout with chatbot
│   │   ├── page.tsx           # Homepage
│   │   └── dyslexia-reading-training/
│   │       ├── page.tsx       # Dyslexia hub (137 KB)
│   │       └── techniques/
│   │           ├── 4-7-8/
│   │           ├── box-breathing/
│   │           ├── coherent/
│   │           ├── sos/
│   │           └── tools/
│   │               ├── breath-ladder/
│   │               ├── colour-path/
│   │               ├── focus-tiles/
│   │               └── roulette/
│   │           ├── progress/
│   │           ├── rewards/
│   │           ├── about/
│   │           ├── contact/
│   │           └── api/
│   │               ├── download-resource/ # Generates HTML resources
│   │               ├── sessions/
│   │               ├── progress/
│   │               ├── badges/
│   │               ├── challenges/
│   │               └── quests/
│   └── components/
│       ├── site-header.tsx      # Navigation with 🧠 logo
│       ├── site-footer.tsx
│       ├── ReadingBuddy.tsx     # Global chatbot
│       ├── BreathingExercise.tsx # Enhanced breathing UI
│       ├── ui/                  # Radix/shadcn components
│       └── [28+ dyslexia components]
│   └── contexts/
│       ├── ProgressContext.tsx
│       └── ReadingLevelContext.tsx
│   └── hooks/
│       ├── useSpeechSynthesis.ts
│       ├── useSpeechRecognition.ts
│       ├── useDorothyAudio.ts
│       └── useLocalStorage.ts
│   └── lib/
│       ├── utils.ts
│       ├── types.ts
│       ├── breathing-data.ts
│       ├── badge-definitions.ts
│       └── challenge-definitions.ts
│   └── public/
│       ├── audio/              # MP3 audio files
│       ├── favicon.svg
│       └── og-image.png
├── .gitignore
└── PROJECT.md                  # Comprehensive 249-line file
                                # This document

```

Component Standards

File Organization

- One component per file
- Use PascalCase for component files (e.g., `RhythmTraining.tsx`)
- Group related files in subdirectories when needed
- Keep components under 500 lines (split if larger)

TypeScript Conventions

```
'use client'; // Always include for client components

import { useState, useEffect } from 'react';
import { Card, CardContent, CardHeader, CardTitle } from '@components/ui/card';
import { Button } from '@components/ui/button';

interface Props {
  title: string;
  difficulty?: 'Beginner' | 'Intermediate' | 'Advanced';
}

export function ComponentName({ title, difficulty = 'Beginner' }: Props) {
  const [state, setState] = useState<Type>(initialValue);

  useEffect(() => {
    // LocalStorage access ONLY in useEffect (SSR safety)
    const saved = localStorage.getItem('key');
    if (saved) setState(JSON.parse(saved));
  }, []);

  return (
    <Card className="w-full">
      <CardHeader className="bg-gradient-to-r from-purple-50 to-pink-50">
        <CardTitle>{title}</CardTitle>
      </CardHeader>
      <CardContent className="pt-6">
        {/* Content */}
      </CardContent>
    </Card>
  );
}
```

SSR/Hydration Safety

- **NEVER** access `localStorage`, `window`, or `document` in component body
- **ALWAYS** wrap browser APIs in `useEffect` or `useLayoutEffect`
- **NEVER** use `Math.random()` or `new Date()` in render (causes hydration errors)
- Pass server data via props from `getServerSideProps` when needed

Audio Integration

```
// Web Audio API (for synthesis)
const audioContextRef = useRef<AudioContext | null>(null);

useEffect(() => {
  if (typeof window !== 'undefined' && !audioContextRef.current) {
    audioContextRef.current = new (window.AudioContext || (window as any).webkitAudioContext)();
  }
  return () => {
    if (audioContextRef.current) {
      audioContextRef.current.close();
    }
  };
}, []);

// HTML5 Audio (for MP3 playback)
const audioRef = useRef<HTMLAudioElement>(null);
const playSound = () => {
  if (audioRef.current) {
    audioRef.current.play();
  }
};

return <audio ref={audioRef} src="/audio/file.mp3" />;
```

LocalStorage Patterns

```
// Loading data
useEffect(() => {
  const saved = localStorage.getItem('feature-progress');
  if (saved) {
    setProgress(JSON.parse(saved));
  }
}, []);

// Saving data
const handleComplete = () => {
  const updated = { ...progress, completed: true };
  setProgress(updated);
  localStorage.setItem('feature-progress', JSON.stringify(updated));
};
```

Content Guidelines

Evidence Banners

Every evidence-based component should include a banner explaining the research:


```
<div className="bg-purple-50 dark:bg-purple-950/50 p-4 rounded-lg border-l-4 border-purple-500">
  <p className="text-sm font-medium text-purple-900 dark:text-purple-100">
    <strong>Evidence-Based:</strong> Research shows [specific finding] improves [specific outcome].
  </p>
</div>
```

Language & Tone

- **Encouraging:** “Great work!”, “You’re building skills!”, “Keep practicing!”
- **Clear:** Use simple, direct language (8th-grade reading level)
- **Respectful:** Avoid infantilizing language for older learners
- **Specific:** “You completed 5 words correctly” vs. “Good job”

Link Standards

- **NEVER** link to broken or inaccessible URLs
- Verify all external links before adding
- Prefer official sources (.edu, .gov, .org)
- Use `target="_blank" rel="noopener noreferrer"` for external links
- Provide descriptive link text (not “click here”)

Future Development Roadmap

Phase 2: Enhanced Content (Q1 2026)

- ☐ ADHD focus training module
- ☐ Anxiety management techniques library
- ☐ Autism sensory regulation tools
- ☐ Sleep hygiene program
- ☐ Parent dashboard with child progress tracking

Phase 3: Social Features (Q2 2026)

- ☐ Educator accounts with classroom management
- ☐ Group challenges and leaderboards
- ☐ Peer support forums (moderated)
- ☐ Progress sharing with parents/teachers

Phase 4: Advanced Features (Q3 2026)

- ☐ AI-powered personalized learning paths
- ☐ Video demonstrations for all techniques
- ☐ Multi-language support (Spanish, French, German)
- ☐ Mobile app (Flutter) with offline mode
- ☐ Wearable device integration (HRV tracking)

Phase 5: Research & Validation (Q4 2026)

- ☐ Clinical trials with partner institutions
- ☐ Published efficacy studies

- ☐ Professional certification program
 - ☐ Integration with school IEP/504 plans
-



Quality Standards

Performance Targets

- **Page Load:** First Contentful Paint < 1.5s
- **Bundle Size:** Individual pages < 150 KB
- **Total JS:** First Load < 300 KB
- **Lighthouse Score:** > 90 across all metrics

Accessibility Requirements

- **WCAG 2.1 AA** compliance mandatory
- **Color Contrast:** Minimum 4.5:1 for text
- **Keyboard Navigation:** All features usable without mouse
- **Screen Reader:** Descriptive ARIA labels on all interactive elements
- **Focus Indicators:** Visible focus rings on all focusable elements

Testing Checklist

Before deploying any new feature:

- ☐ TypeScript compilation passes (`yarn tsc --noEmit`)
 - ☐ Build completes successfully (`yarn build`)
 - ☐ No console errors in browser
 - ☐ No hydration errors
 - ☐ LocalStorage persistence works
 - ☐ Audio playback functions correctly
 - ☐ All links are valid and accessible
 - ☐ Mobile responsive (test 320px, 768px, 1024px)
 - ☐ Keyboard navigation works
 - ☐ Screen reader announces correctly
 - ☐ High contrast mode readable
-

Collaboration Guidelines

Git Workflow

```
# Create feature branch
git checkout -b feature/add-anxiety-module

# Make changes, test thoroughly
yarn tsc --noEmit
yarn build

# Commit with descriptive message
git add .
git commit -m "Add anxiety management module with 5 techniques"

# Push and create PR
git push origin feature/add-anxiety-module
```

Commit Message Format

```
<type>: <subject>

<body>

<footer>
```

Types:

- feat : New feature
- fix : Bug fix
- docs : Documentation update
- style : Formatting changes
- refactor : Code restructuring
- test : Adding tests
- chore : Maintenance tasks

Examples:

```
feat: Add Rhythm Training game for phonological awareness

- Implemented 6 difficulty patterns with audio sync
- Added mastery tracking with localStorage
- Included evidence banner with research citation

Closes #123
```

Code Review Standards

All PRs must:

1. Pass TypeScript compilation
2. Pass build process
3. Include updated documentation
4. Have descriptive commit messages
5. Include accessibility attributes

- 6. Be tested on mobile devices
- 7. Have no console errors

Support & Resources

Research Sources

- **Dyslexia:** International Dyslexia Association (dyslexiaida.org)
- **ADHD:** CHADD (chadd.org), ADDitude Magazine
- **Autism:** Autism Self Advocacy Network (autisticadvocacy.org)
- **Breathing:** Harvard Medical School, Mayo Clinic, NHS
- **Education:** Reading Rockets, What Works Clearinghouse

Technical Documentation

- **Next.js:** <https://nextjs.org/docs>
- **TypeScript:** <https://www.typescriptlang.org/docs>
- **Tailwind CSS:** <https://tailwindcss.com/docs>
- **Radix UI:** <https://www.radix-ui.com/primitives/docs>
- **Web Audio API:** https://developer.mozilla.org/en-US/docs/Web/API/Web_Audio_API

Contact

- **Project Lead:** [To be assigned]
- **Technical Lead:** [To be assigned]
- **Clinical Advisor:** [To be assigned]
- **Support Email:** support@neurobreath.co.uk



Change Log

v1.0.0 (December 23, 2025)

- ☒ Initial project structure established
- ☒ Dyslexia reading training hub completed (28+ components)
- ☒ Breathing techniques with enhanced features
- ☒ Global Reading Buddy chatbot
- ☒ Progress tracking and rewards system
- ☒ Downloadable resources API
- ☒ Comprehensive .gitignore
- ☒ Production-ready with zero critical issues



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Project Status:  **PRODUCTION READY**

Last Checkpoint: "Production-ready dyslexia page with bug fixes" (Dec 23, 2025)

Next Milestone: Phase 2 content expansion (Q1 2026)