Software Requirements Specification (SRS)

Autism Emotional Support Application (ASD Project)

Supporting Emotional Expression and Regulation
for High-Functioning Autistic Children

Project Information

Course: Final Project
Document Type: Software Requirements Specification (SRS)
Standard: IEEE Std 830-1998
Academic Term: 2025–2026

Authorship & Responsibility

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1. Introduction

1.1 Purpose

We are building a mobile app for **children (ages 10–17) with high-functioning autism** that helps them recognize, express, and regulate emotions in a simple, visual, and supportive way. The app also provides parents and therapists with structured insights, while ensuring privacy and role-appropriate access.

1.2 Scope

1.2.1 Problem

Children on the autism spectrum often struggle to identify and communicate their emotions in the moment. This can lead to emotional overload, meltdowns, social misunderstandings, and gaps in therapy follow-up. Parents frequently lack visibility into their child's inner world, and therapists rarely get a full picture of emotional patterns outside of clinical sessions.

1.2.2 Our Solution (at a glance)

- **Emotion logging that's child-friendly:** task → emoji/emotion → intensity slider → optional photo/note. Quick and pressure-free.

- **Role-based dashboards:** child, parent, and therapist each see a customized interface.

- **Parental & therapist access:** since the app is for under-18 users, all emotional logs and insights are automatically available to parents and therapists.

- **Prompts & reminders:** gentle nudges encourage regular logging; parents and therapists can set or customize tasks.

- **Actionable insights:** parents and therapists see summarized trends and high-intensity "flagged" entries instead of raw data overload.

1.2.3 Value Proposition

- **For the child (10–17):** a safe, visual, and non-verbal way to express feelings, reducing emotional overload.

- **For parents:** a clearer understanding of triggers and patterns to improve support at home.

- **For therapists:** longitudinal emotional data between sessions to guide interventions more effectively.

1.3 Definitions, Acronyms, Abbreviations

This subsection provides definitions and explanations for terms, acronyms, and abbreviations used throughout this SRS.
(Additional terminology is also listed in **Appendix A – Glossary**.)

Term / Acronym	Definition
App	Refers to the Autism Support mobile application developed in this project.
ASD	Autism Spectrum Disorder — a neurodevelopmental condition affecting communication, behavior, and sensory processing.
HFA	High-Functioning Autism — describes individuals with ASD who have average or above-average intellectual abilities and functional language.
Child User	A user aged 10–17 with high-functioning autism who uses the app to log and express emotions.
Parent User	The child's guardian who monitors emotional patterns and creates tasks via the app.
Therapist User	A psychologist or counselor who reviews logs and provides feedback (via web dashboard).
Log / Emotion Log	A recorded entry describing an emotional state — includes emoji, intensity, optional photo/note, timestamp, and context.
Task (Prompted Log)	A structured emotional check-in created by a parent or therapist, prompting the child to log emotions for a specific situation.
Room API	Android persistence library used to simplify SQLite database access for local caching.
SQLite	Local database engine embedded within the Android device, used for offline storage of logs and tasks.

Firebase	Google's mobile and web application development platform providing Authentication, Firestore Database, Cloud Storage, and Cloud Messaging.
Firestore	Firebase's real-time NoSQL database used for cloud-based data storage.
FCM	Firebase Cloud Messaging — service for sending notifications and reminders to users.
MVP	Minimum Viable Product — the first working release of the application including core features (logging, tasks, dashboards, and reports).
WCAG 2.1 AA	Web Content Accessibility Guidelines, Level AA — accessibility standards for digital interfaces.
COPPA	Children's Online Privacy Protection Act — U.S. regulation protecting data of minors under 13.
GDPR-K	General Data Protection Regulation for Kids — EU data protection framework applied to minors' information.
API Level 26	Android version 8.0 (Oreo) — the minimum supported OS version for this app.
JSON	JavaScript Object Notation — data format used for structured storage and communication between Firebase and the app.

1.4 References

This subsection lists the primary standards, tools, and resources referenced in the preparation of this SRS.

Reference ID	Title / Source	Details

[1]	*IEEE Std 830-1998*	IEEE Recommended Practice for Software Requirements Specifications.
[2]	*IEEE Std 1058-1998*	IEEE Standard for Software Project Management Plans.
[3]	*Google Firebase Documentation*	https://firebase.google.com/docs — Authentication, Firestore, Cloud Messaging, and Storage setup.
[4]	*Android Developers Guide*	https://developer.android.com — Room API, SQLite integration, and Android Studio reference.
[5]	*Web Content Accessibility Guidelines (WCAG) 2.1*	W3C Recommendation, June 2018 — accessibility standards for visual interfaces.
[6]	*COPPA Compliance Guide*	U.S. Federal Trade Commission (FTC) resource on children's privacy compliance.
[7]	*GDPR for Children's Data (Article 8)*	European Union regulation on data processing for minors under 16.
[8]	*Firebase Security Rules Reference*	https://firebase.google.com/docs/rules — for defining access and permissions.
[9]	*Android Studio User Guide*	JetBrains & Google — official IDE documentation for Android development.

All references listed above are publicly accessible via their respective publishers or official documentation websites.

1.5 Overview

This SRS describes the complete set of software requirements for the Autism Emotional Support Application.

- Section 1 (Introduction) defines the purpose, scope, terminology, references, and overall organization of the document.

- Section 2 (Overall Description) provides the system context, product perspective, user characteristics, constraints, and dependencies that shape the app's design.
- Section 3 (Specific Requirements) details all functional and non-functional requirements — what the system must do and how it must behave.
- Appendix A contains the glossary of terms, abbreviations, and additional supporting definitions.
- Appendix B (Optional) may include a requirements traceability matrix linking system functions to user needs.

The SRS is organized to comply with the IEEE Std 830-1998 structure, ensuring each requirement is clear, verifiable, and traceable throughout design and testing.

2. Overall Description

This section provides background and contextual information to make the detailed requirements in Section 3 easier to understand.
It does **not** state specific requirements.

2.1 Product Perspective

The Autism Emotional Support Application is a **stand-alone Android mobile application** supported by **Firebase backend services** (Authentication, Firestore Database, Cloud Storage, and Cloud Messaging).
The system consists of two major interfaces:

1. **Mobile App:** for **children** and **parents** (fully implemented).

2. **Web Dashboard (future expansion):** for **therapists**, which will read shared data through Firebase.

All components communicate through secure REST APIs and Firebase SDKs.

2.1.1 System Interfaces

- **Firebase Authentication:** manages sign-in, registration, and role recognition.

- **Firestore Database:** cloud storage for logs, tasks, and feedback.

- **Firebase Cloud Messaging (FCM):** push notifications and reminders.

- **Firebase Storage:** handles photo or voice-note uploads.

2.1.2 User Interfaces

- **Child Interface:**
  Emoji-based emotion picker → intensity slider (1–5) → optional photo/note → color-coded timeline of past entries.

- **Parent Interface:**
  Dashboard for viewing child logs, flagged emotions, and adding new tasks.

- **Therapist Dashboard (Future):**
  Planned web portal showing graphs, trends, and feedback options.

Interfaces support **Arabic and English** (right-to-left layout for Arabic) and comply with **WCAG 2.1 AA** accessibility guidelines—large icons, predictable navigation, minimal text.

2.1.3 Hardware Interfaces

- **Devices:** Android smartphones or tablets.

- **Minimum Requirements:** Android OS 8.0 (API 26) or higher, ≥ 2 GB RAM, active internet.

- **Optional:** Camera (for photos) and microphone (for voice notes).

2.1.4 Software Interfaces

- **Operating System:** Android (Java).

- **Development Environment:** Android Studio (latest stable version).

- **Backend Services:** Google Firebase (Authentication, Firestore, Cloud Storage, FCM).

- **Local Database: SQLite** integrated through **Room API** for offline caching of user logs, tasks, and metadata.

- **Sync Logic:** Room stores data locally and synchronizes with Firestore when connectivity returns.

- **Third-Party Libraries:** Open-source UI / accessibility / Firebase libraries under MIT or Apache licenses.

- **Database Structure:**

  - **Firestore:** master cloud database (logs, tasks, feedback).

  - **SQLite (Room):** cached local copy; merged with Firestore during sync.

2.1.5 Communications Interfaces

- All communications use **HTTPS (TLS 1.2 or higher)**.

- Firebase SDKs provide secure authentication and real-time data updates.

- Push notifications delivered through **Firebase Cloud Messaging**.

2.1.6 Memory Constraints

- Application size ≤ 200 MB.

- Local SQLite database ≤ 50 MB.

- Cached data and attachments ≤ 100 MB total.

- Photo ≤ 5 MB each; voice note ≤ 60 s / 5 MB.

- Firebase Storage quota managed within academic project limits.

2.1.7 Operations

- **Active Mode:** User logs emotions or completes tasks.

- **Background Sync:** Automatic data upload when online.

- **Maintenance:** Firebase performs daily backups.

- **Recovery:** Users reinstall and re-authenticate to restore cloud-synced data.

2.1.8 Site Adaptation Requirements

- App launches in **English** by default; users may switch to **Arabic**.

- Firebase project credentials (API key, Sender ID) must be configured before deployment.

- Future therapist dashboard will require additional authentication setup.

2.2 Product Functions

Function Group	Description
Authentication & Access Control	Role-based login for child, parent, therapist.
Emotion Logging	Children create regular (self-initiated) and task-based (prompted) logs.
Task Management	Parents add, edit, or delete tasks prompting children to log emotions.
Notifications & Reminders	FCM push alerts for new tasks or missed logs.
Dashboard & Feedback	Parents see logs and flagged emotions; therapists (future) view summaries.
Localization & Accessibility	Arabic and English support; large icons, simple navigation.
Data Security	Firebase Authentication + Firestore security rules protect all user data.

2.3 User Characteristics

User Type	Profile Summary	Experience / Needs
Child (10–17)	High-functioning autism; strong memory; prefers visual learning.	Needs intuitive UI, minimal text, predictable navigation.

| Parent | Caregiver who monitors and supports the child. | Moderate mobile experience; prefers clear instructions and simple controls. |
| Therapist | Licensed psychologist / counselor with ASD focus. | Comfortable with data dashboards; values concise summaries. |

2.4 Constraints

Constraint Type	Description
Platform	Android-only (Java, Android Studio).
Languages Supported	Arabic and English only; RTL layout supported for Arabic.
Backend Framework	Firebase (Cloud Firestore, Authentication, Storage, FCM).
Local Storage	SQLite + Room API for offline caching.
Budget	No funding; uses free academic resources.
Timeline	Fixed academic semester (~14 weeks).
Regulatory	Compliance with COPPA and GDPR-K for minors.
Hardware	Android devices only; no iOS support.

2.5 Assumptions and Dependencies

- Users have an active Google account for Firebase Authentication.
- Internet access available for sync and notifications.

- **SQLite + Room API** provides local storage for temporary offline use.
- Firebase and Room integration resolves basic conflicts (last-write wins).
- Android Studio emulators and real devices will be used for testing.
- Firebase SDK and Room libraries remain compatible with Android SDK version used.

2.6 Apportioning of Requirements

Deferred Feature	Reason for Deferral
iOS Version	Requires different language (Swift) and toolchain.
Therapist Web Dashboard	Planned for post-MVP phase.
Offline Sync Enhancements	Future improvement once core features stabilize.
Gamification / Rewards	Future UX enhancement to encourage child engagement.

2.7 Supporting User Research

To ensure that the Autism Emotional Support Application meets the real needs of its intended users, a set of detailed **User Personas** was developed during the requirements-elicitation phase.
 These personas synthesize interview findings and expert input into realistic representations of the system's three primary roles:

- **Persona #1 – Child (User):** A high-functioning autistic child who uses the mobile app to recognize and express emotions through visual logging tools.
- **Persona #2 – Parent (User):** The guardian who monitors emotional patterns, creates prompted tasks, and reviews therapist feedback.
- **Persona #3 – Therapist (User):** A licensed clinician who reviews the child's logs, provides feedback, and analyzes emotional trends through the professional interface.

The complete persona profiles—including demographic summaries, behavioral insights, goals, frustrations, and usage scenarios—are documented in a supporting presentation:

User Personas Presentation (PPTX): 🅿 Persona[1].pptx

This presentation serves as a design reference throughout development, helping to align functional and non-functional requirements with the emotional, cognitive, and usability characteristics of real users.

3. Specific Requirements

This section defines all software requirements to a level of detail sufficient for design and testing.
 Each requirement is externally perceivable and verifiable, as required by the IEEE 830 standard.

3.1 Functional Requirements

These describe what the system shall do — observable, testable behaviors.

ID	Category	Functional Requirement
FR 1	User Roles & Access Control	The system shall support three user roles: **Child**, **Parent**, and **Therapist**, each with distinct permissions and dashboards.
FR 2		The system shall require user authentication through secure, role-based sign-in using Firebase Authentication.
FR 3		Parents and therapists shall automatically gain access to the child's logs and insights, since all child users are minors.
FR 4	Emotion Logging (Child)	The child shall be able to create a **regular emotion log** at any time by selecting context / situation → emoji / emotion → intensity (1–5 slider) → optional note / photo.
FR 5		The system shall timestamp and securely store each log in the child's profile.

FR 6		The system shall allow the child to view previous logs in a calendar or list format.
FR 7	Task-Based Logging	Parents or therapists shall be able to create **tasks** (structured emotional check-ins) specifying title, time, and context (e.g., "After school check-in").
FR 8		The system shall send a push notification or prompt to the child when a task is due, using Firebase Cloud Messaging (FCM).
FR 9		The child shall respond to a task using the same emotion-logging interface (emoji + intensity + optional note / photo).
FR 10		Completed task entries shall be linked to their originating task for later analysis.
FR 11	Reminders & Notifications	Parents and therapists shall be able to enable, disable, or schedule reminders for emotion logging or tasks.
FR 12	Parental Dashboard	The parent's dashboard shall summarize the child's emotional trends, showing flagged high-intensity events and recent logs.
FR 13		Parents shall be able to view all logs (both spontaneous and task-based).
FR 14		Parents shall be able to edit or delete a task only if the child has not yet responded. Once a response exists, the task becomes locked.
FR 15		Parents shall be able to read therapist feedback linked to their child's logs.
FR 16	Therapist Dashboard	Therapists shall have access to dashboards with visual summaries (graphs, heatmaps, and flagged entries).
FR 17		Therapists shall be able to assign targeted tasks to specific children.

FR 18		Therapists shall be able to attach notes, feedback, or session summaries to a child's log.
FR 19		Therapists shall be able to export reports for parent meetings or clinical records.
FR 20	Insights & Analytics	The system shall provide aggregated emotional-data ualizations: trends, averages, peaks, and time-based patterns, and shall automatically flag high-intensity emotions (≥ 4).
FR 21	Privacy & Data Sharing	The system shall ensure that only authorized users (linked parent and therapist) can access a child's emotional logs.
FR 22		The system shall require explicit parental consent for child registration and therapist linkage.
FR 23		The system shall encrypt all stored emotional logs, photos, and notes.
FR 24	Reports & Exporting	The app shall allow exporting of reports (PDF / CSV) summarizing emotional patterns over time.
FR 25	Localization & Accessibility	The system shall support **Arabic** and **English** interfaces.
FR 26		The system shall include accessibility options such as large cons, visual schedules, minimal text, and sensory-friendly colors.
FR 27	Offline Caching	The app shall allow local caching of logs using **SQLite + m API** when the device is offline, and synchronize data with Firestore once connectivity is restored.
FR 28	Feedback Loop	Parents and therapists shall receive feedback or confirmation when a child completes a task.
FR 29	Onboarding & Guidance	The app shall provide a short tutorial or walkthrough for each user role (Child, Parent, Therapist).

FR 30	Cross-Role Communication	The system shall not include direct chat features; all communication occurs through shared logs, tasks, and therapist feedback visible in dashboards.
FR 31	Shared Visibility	The system shall automatically share all logs and tasks created by / for a child with both the parent and the therapist, each record showing creator and timestamp.
FR 32	Shared Feedback Visibility	Therapist feedback attached to logs shall be visible to both the parent and the child; completion of a task shall update both dashboards automatically.
FR 33	Role-Specific Notifications	The system shall deliver notifications according to role:• Child – reminders and task prompts.• Parent – missed-log alerts and new therapist feedback.• Therapist – new-log alerts and flagged high-intensity entries.
FR 34	Report Access	Parent and therapist dashboards shall display summarized emotional history for the child, filtered by each user's access level.

3.2 Non-Functional Requirements

These describe *how* the system shall behave — quality, performance, and usability characteristics.

ID	Category	Non-Functional Requirement
NFR 1	Usability / Accessibility	The interface shall be simple, predictable, and visual, supporting children with sensory sensitivities.
NFR 2		The system shall use large icons, minimal text, and neutral colors to reduce sensory overload.
NFR 3		Navigation shall follow a consistent structure with clear feedback after each user action.

FR 4	N	Performance	Average response time for user actions shall not exceed 2 seconds under standard network conditions.
FR 5	N		Synchronization of logs with the cloud shall occur in the background without disrupting user interaction.
FR 6	N	Reliability & Availability	The app shall rely on Firebase's managed uptime for backend services to ensure consistent availability.
FR 7	N		The app shall gracefully handle network interruptions and automatically retry failed synchronizations.
FR 8	N	Security & Privacy	All communications between client and server shall use HTTPS (TLS 1.2 or higher) with end-to-end encryption.
FR 9	N		The system shall comply with **COPPA** and **GDPR-K** guidelines governing minors' data.
FR 10	N		Photos and notes shall never be shared outside the parent-therapist-child group without explicit consent.
FR 11	N	Maintainability	The codebase shall follow a modular architecture to allow easy addition of new roles or features.
FR 12	N	Compatibility	The app shall support **Android 8.0 (API Level 26)** or higher.
FR 13	N	Scalability	The system shall support at least 50 concurrent users efficiently in the academic prototype and allow modular scaling later.
FR 14	N	Localization	The app shall allow switching between Arabic and English interfaces without data loss.
FR 15	N	Data Integrity	Emotional logs shall not be editable once submitted by the child.

		Auditability	All actions (task edits, feedback, deletions, exports) shall be timestamped and attributed to the responsible user.
FR 16	N		
FR 17	N	Ethical Compliance	The app shall prioritize the child's emotional safety — no ads, no gamified pressure, and no public sharing of data.