

A Checklist for Dyslexia Accessible Mobile Design Proposal

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ABSTRACT

Dyslexia is a neuro-biological disorder that affects a significant part of the population around the world, affecting and limiting the reading capability. The screening of dyslexia is a difficult, long-time process in our country, but at this moment, there is no instrument to support this process. Our long-term objective is the development of a reading assistant for dyslexic children that could also identify the dyslexia risk based on audio fragments of children's lectures. In this paper, we propose a checklist for accessible mobile design for dyslexic people inspired by existing guidelines, web design standards, and heuristics. We apply the checklist to evaluate a small mobile application meant for creating an audio dataset with children's lectures and to redesign it accordingly. The audit is performed before testing with real users, and no child participants were involved. The audit mainly revealed issues with data privacy handling that might be easily missed otherwise, and other concerns related to contrasts and typography.

AUTHOR KEYWORDS

Dyslexia; accessibility; heuristic evaluation, mobile applications, Romanian, reading screening, children.

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INTRODUCTION

Dyslexia is a learning disorder characterized by difficulties with reading comprehension and reduced reading experience, which can hinder vocabulary development and general knowledge [8]. Globally, dyslexia affects approximately 15% of the population, including over 39 million adults across the USA, UK, and Canada [4]. In Europe, 6-10% of children are affected. Romania is probably between the percentages of European statistics, suggesting that nearly every Romanian classroom contains at least one dyslexic student [16]. Still, Romania has no validated instrument for screening developmental dyslexia in its own language. David et al. [3] noted that at the time of their study, there was "a lack of valid instruments for the diagnosis of dyslexia in Romania," resorting instead to an informal reading probe and a teacher's referral. Considering this context, the long-term goal of our work is to develop a reading assistant tool to provide support for reading improvement, constant feedback on reading, and early identification of dyslexia signs to help children with learning disorders. However, the user interface of such a tool should

be designed with their challenges in mind, and assessing the accessibility of such an application requires a set of guidelines adapted to the users' specific limitations.

Although there are guidelines and recommendations for specific users, these do not cover all relevant aspects considering the challenges of dyslexic people, especially children, and also privacy concerns. The aim of this paper is to propose a list of checkpoints that can be used to assess the user interfaces of mobile applications addressed to children, considering the challenges that dyslexic children face. These checkpoints are meant to be evaluated before any other kind of usability evaluation is performed and without involving any children or real users.

The original contributions of this paper are: a list of checkpoints for dyslexia-accessible mobile design adapted for Romanian user interfaces, which combines existing guidelines and heuristics, and an example of performing an audit of a mobile application using this checklist, together with the results obtained and the subsequent steps performed.

The remainder of this paper is organized as follows. We first review existing guidelines and recommendations. Then we introduce our proposed checklist and the mobile application utilized as a case study. Afterwards, we detail our evaluation methodology, present the obtained results, discuss subsequent steps, and address the limitations of our proposal. Finally, we conclude the paper with a summary of key findings and directions for future work.

RELATED WORK

Presently there are some recommendations for dyslexia-friendly design, like the British Dyslexia Association's *Dyslexia Style Guide*, now in its 2023 revision [2], Rello and Baeza-Yates studies [12, 14, 15] and Zorzi et al. study [18], but they do not combine all the necessary aspects for designing mobile application for dyslexic children. The Dyslexia Style Guide recommends sans-serif fonts, generous font size, left-aligned unjustified text, short lines, chunking headings, and cream or pastel backgrounds instead of white. Rello and Baeza-Yates studies found that sans-serif, monospaced, an 18-point size minimum limit for font size, and roman styles improve reading speed over serif/proportional/italic alternatives, and that "dyslexia fonts" do not outperform a well-chosen ordinary sans-serif [12, 14, 15]. Zorzi et al. emphasized the benefits of using ~18% inter-letter spacing for dyslexic children [18].

Each language has specific challenges for the dyslexic readers, that transfer to the way the presentation layer of the applications is designed. The study of David et al. [3] showed that for the Romanian language, the ways ș/ț diacritics are displayed significantly impact reading. The recommended format is comma-below ș/ț diacritics, without cedilla-variants.

There are a few guidelines for user interfaces for children, like Khowaja and Salim's ASD heuristics [9] or the usability heuristics evaluation for child e-learning applications of Alsumait and Al-Osaimi [9], but they do not address specific categories of users with special needs.

CHECKLIST PROPOSAL

The set of guidelines that we propose for dyslexia-accessible mobile design auditing was constructed by merging different bodies of guidance and adapting some of them to the Romanian language:

- (1) British Dyslexia Association's Dyslexia Style Guide [2]. The guide supplies concrete typography, color, and writing-style rules. It is a design guide, and we combined its numeric recommendations against Rello and colleagues' studies [12, 14, 15], which provide concrete thresholds for the evaluated aspects.
- (2) WCAG 2.2 [17]. It contributes formally to testable checkpoints: contrast, target size, resize behavior, and applied analogically.
- (3) Alsumait and Al-Osaimi's child-e-learning HECE heuristics [1]. We added these heuristics for mobile applications that target children or could also be used by them. Children with dyslexia might operate a mobile application, so we included checkpoints in this regard.
- (4) UK ICO's Age Appropriate Design Code [7] and GDPR Article 8 [5]. Nowadays, many mobile applications handle a person's voice recordings or other private data, so we included some child-data-protection checkpoints from UK ICO's Age Appropriate Design Code and GDPR Article 8, as design-guideline references.

The final checklist contains 36 checkpoints across seven categories. The categories are presented in Table 1 and the full set of 36 checkpoints with per-item sources is presented in the Annex. Three checkpoints were adapted for the Romanian setting:

- T1 (typeface) adds ș/ț glyph correctness (comma-below forms, standardized in 1999, reliably supported only since 2007) against readers prone to letter confusion.
- N5 (chunking) adds a syllable-level rationale, given Romanian's simple CV/CVC structure and syllable-based literacy instruction.
- F1 (status) is reweighted toward fluency, since speed is the more diagnostically reliable signal for Romanian dyslexic readers.

Each checkpoint is scored on a five-level scale (*met*, *partially met*, *not met*, *not applicable*, *not assessable*) rather than binary pass/fail. We recommend a further rule to prevent double-counting: if a missing prerequisite fails other several dependents, only the prerequisite should be scored *not met*, and the dependents should be scored *not applicable*. For instance, if no text-to-speech feature exists (checkpoint

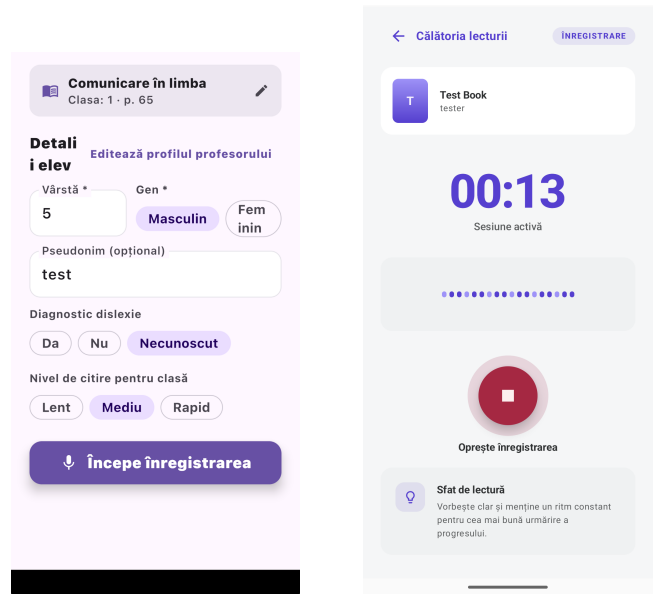


Figure 1: REC-RO Screens

M1 should be evaluated as *not met*), and synchronizing high-lighting with narration (checkpoint M2) should be evaluated as *not applicable*, not a second failure.

Category	IDs	#	Primary sources
Typography & Text	Ts	8	BDA [2]; Rello & Baeza-Yates [12, 14, 15]
Colour & Contrast	Cs	6	WCAG 2.2 [17]; BDA [2]; Rello & Baeza-Yates [14]
Navigation & Input Burden	Ns	6	WCAG 2.2 [17]; BDA [2]; HECE [1]
Audio & Multimodality	Ms	4	BDA [2]; HECE [1]
Feedback & Error Handling	Fs	4	Nielsen & Molich [10]; HECE [1]; BDA [2]
Motivation & Gamification	Gs	4	HECE [1]
Privacy & Child Safety	Ps	4	ICO AADC [7]; GDPR Art. 8 [5]

Table 1: Checkpoints' distribution, by category.

THE REC-RO APPLICATION

We tested the proposed checklist on the REC-RO application, a mobile application developed for two platforms, Android and iOS. REC-RO is a reading-recording tool available on the Google Store. It can be used in two modes: a teacher-coordinated session or a sign-in-free guest mode where a child can run it alone. The application's most important screens are shown in Figure 1. A recording session setup screen taken on an iPhone 13 mini (left) and the active-recording screen (right) taken on a Pixel. The setup screen contains privacy-relevant fields such as age, gender, pseudonym, diagnosis, or reading level. The recording screen shows only a large digital timer, a live waveform, and a single red stop control. REC-RO supports two session flows through the same screens. In a teacher-coordinated session, the teacher opens the setup screen, selects a book title and/or publisher and a grade between 1 and 8, enters the child's nickname, age, gender, a dyslexia-diagnosis flag, and a subjective reading-level rating,

starts the recording, and hands the device to the child. In guest mode, launched without sign-in, a child can complete the identical flow without supervision, entering the same fields and starting and stopping the recording. The child's recordings queue locally, uploading them to a custom-created dataset only once a teacher later signs in on that device and is approved. In both modes, the application displays no reading passage: the child reads aloud from a physical book, and the running screen shows only the large digital timer, the live waveform, and the single red stop control. Tapping the stop button offers a re-record or submit action, which creates a pull request against a public dataset-hosting platform. The pull request is conditioned on a teacher signing in and on the administrator's approval. If both conditions are met, the upload is automatically started.

The UI interface is bilingual: the English and Romanian string tables are line-for-line parallel (178 keys each), with an in-app language switcher. Romanian text uses the comma-below Unicode forms for ș/ț. Architecturally, REC-RO was built with Kotlin Multiplatform for both Android and iOS. The platform-specific source code shares some common code for screens, view model, data layer, but each version has its specific storage, authentication, and audio capture.

When a recording is sent for storing, it carries a metadata bundle alongside the audio file, containing the nickname, age, gender, grade, dyslexia-diagnosis status, and reading-level rating. The information was entered at setup by the teacher or the child. Data privacy consent is supposed to be obtained via an offline paper parental-consent form plus a one-time in-app consent screen. The project also maintains a data-safety declaration and child-directed-content classification in both stores' listings.

EVALUATION

We applied the proposed checklist using a walkthrough technique and by inspecting the application's code. The walkthrough covers both flows allowed in the app: a teacher-coordinated script (setting up a reading session, starting and stopping it, reviewing the recording, and submitting it to the dataset) and a guest-mode script performed as an unaccompanied child would (setting up a reading session, starting and stopping it). As several checkpoints concern properties not observable by tapping through the app alone (a font's genuine dyslexia-tuning, a color hex code vs. a theme token), we additionally performed source-code inspection as a complement. For each checkpoint, every rating was justified by an observed behavior, a code citation, or both. The walkthrough covered both versions of the app: the Android version running on a Pixel mobile device and the iOS version running on an iPhone 13 mini (Figure 1). Since both versions share the same Kotlin multiplatform codebase, code-level findings apply to both versions, while walking through may uncover platform-specific issues.

The evaluation was performed by the authors, following an established method for assessing dyslexia-support software without a child study [11]. The audit was conducted jointly, and every rating was linked to a code citation, an observed behavior, or both. Disagreements were resolved by discussing and following the evidence. No independent double-scoring or computation of inter-rater agreement was performed in this case.

Results

The proposed checklist was applied to REC-RO, using its source, assets, and project documentation for evaluation. The results obtained for each category are summarized in Table 2. In the first round of evaluation, out of the 36 checkpoints from our list, 14 checkpoints were evaluated as *met*, 6 checkpoints were *partially met* (*P. met*), 10 checkpoints were *not met*, 6 checkpoints were *not applicable* (*N/A*), and no checkpoint was evaluated as *not assessable*. The REC-RO app has no on-screen reading passage, so the child should read from a physical textbook, and the app only records audio, with a timer/waveform as passive feedback. Consequently, the checkpoints addressing a reading surface (bounded line length, synchronized highlighting, difficulty adjustment) are scored *not applicable* rather than *not met*.

In the following, we detail the findings of our evaluation.

One strength of this app is the bilingual coverage: every string key has a matching Romanian counterpart, with correct comma-below ș/ț diacritic forms throughout the entire application. No cedilla-variant glyphs were found.

Regarding typography-related checkpoints, the pattern uncovered is the usage of Material3's ([6]) stock type scale, with no custom typography, dyslexia-oriented font, or spacing tuning. The size of body text is unmodified `bodySmall`, `bodyMedium`, or `bodyLarge` styles, which are all below the 18-point threshold for faster dyslexic reading [14, 15]. The text is mostly centered rather than left-aligned. The badge text and the recording timer use small-caps and tightened spacing (the opposite of the literature's recommendation [18]). There are no settings allowing the display in dark mode, no change of color or other theme controls, and the fixed light scheme used ignores any other system preference.

Testing on two platform-specific devices detected a defect invisible on the Android platform. On the iPhone 13 mini's narrower display (Figure 1, left), the session-setup screen wraps words mid-word without hyphenation: "Detalii elev" breaks as "Detalii-"/"i elev" and "Feminin" as "Fem-"/"inin". The defect is narrow-viewport, not iOS-specific, since only one device per platform was tested.

The application is not meant to have an on-screen passage, so one checkpoint (bounded line length) is considered *not applicable* rather than failed (or *not met*), while the other checkpoints remain *not met* (default sizing/spacing, small-caps badges, no dark mode). We consider this to be a UI-polish gap, not a reading-experience gap. The child holds the device throughout Recording's timer/stop chrome and, in guest mode, operates Setup directly, so Setup typography is a child-operated screen.

The screens that a child might operate, either as guest-mode principal or teacher-coordinated device-holder (Welcome, Setup, Recording), score well on navigation and feedback: every screen has exactly one dominant action (the Stop control having the size of 80 density-independent pixels, which is over the 24px minimum), with recording state continuously visible via a live timer, waveform, and status badge. The interruptions do not penalize the child's activity: if the OS reclaims audio focus mid-session, the recording is stopped and retained, and a recovery dialog restores an in-progress recording after the process finishes. The timer counts up, avoiding the countdown-pressure pattern the checkpoints warn against. However, there is also a problem. Tapping the Stop control ends the recording immediately, with no confirmation. All

Category	Met	Partially met	Not met	Not applicable	Not assessable	Total
Typography & Text	3	0	4	1	0	8
Colour & Contrast	4	1	1	0	0	6
Navigation & Input Burden	3	2	0	1	0	6
Audio & Multimodality	0	1	1	2	0	4
Feedback & Error Handling	3	0	1	0	0	4
Motivation & Gamification	0	1	1	2	0	4
Privacy & Child Safety	1	1	2	0	0	4
Total	14	6	10	6	0	36

Table 2: Checkpoints' audit results by category.

back-navigation during an active or unsubmitted recording is guarded by a discard-confirmation dialog, whereas Stop is not, so an accidental tap will silently end and discard the recording, leaving only “Re-record” control on the screen.

Our audit's most severe findings were found in the privacy category, and they all cluster around one mechanism: special-category information about the child is designed to travel through a channel more exposed, and less consent-covered, than the rest of the app's data handling.

As per the application design, per-recording metadata like book title, page, grade, the child's age, gender, nickname, dyslexia-diagnosis status (yes/no/unknown), and reading-level rating are embedded in a human-readable pull request that the app sends to a public dataset-hosting platform, that spells out “Dyslexia: {status}, Reading level: {level}” as plain text, with no access-controlled field. This might create a re-identification risk if this data is combined with the identifying audio and a small classroom where nickname, age, gender, and grade might single out one child.

Another identified privacy problem in the app is the lack of a consent screen for the collection of all metadata. The application states that only nickname, age, and grade are stored, with no real names, but it does not mention anything about the diagnosis and reading-level information being sent. Before using the application, the users should fill in a paper consent form that classifies the collection as special-category data under GDPR Article 9, but the person using the application does not always have access to this consent form (especially children). Another related, narrower point is that the app was classified as not child-directed on the rationale that it would mostly be teacher-operated, but that rationale describes only the teacher-coordinated flow. The guest mode lets a child launch, complete, and submit the entire setup-and-record flow with no adult present, so the classification's premise does not hold across both modes it must cover, independent of who the data subjects are.

No behavioral profiling, advertising, or dark patterns appeared anywhere in the design and code of the application, which the authors consider to be a strength of the design.

Discussion

The application's main issues that must be fixed before real user testing are summarized in Table 3. They refer mainly to public-metadata exposure, an incomplete consent screen, an unverified consent step, and backend read access gated only by authentication. Presently, the privacy aspects are very important, and they should be resolved before any real-user

testing takes place and before any data is sent to the public dataset.

A remediation step was performed after the first round of the evaluation, where the highest-priority identified problems were fixed. Special-category and the fields from the public pull-request text were removed; the consent text was rewritten to enumerate every field in both languages; the dyslexia-aware typography ($\geq 1.5\times$ line spacing, wider letter spacing, left-alignment) was included; an OS-following dark colour scheme was added, and a stop-confirmation dialog was introduced. The diagnosis field was reframed to “formal dyslexia diagnosis documented”. It is always present on the screen but was considered optional, with its value defaulting to “unknown,” with guidance to select “yes” only if a formal CJRAE/CMBRAE evaluation exists. This approach should reduce mislabeling, but it might also introduce selection bias, as children from some geographical locations (e.g., rural) are least likely to have a formal evaluation, under-representing the population the tool most needs.

After the remediation step, we re-evaluated the application using the same criteria, focusing especially on every checkpoint touched by remediation. This re-evaluation was performed by the same people as the original audit, under the same unchanged scoring standard. Four checkpoints were evaluated as *partially met* (they were previously *not met*), but no checkpoint was newly evaluated as *met* after the remediation step. Overall, from a distribution of 14 *met*, 6 *partially met*, 10 *not met*, and 6 *not assessable* checkpoints, the distribution changed to 14 *met*, 10 *partially met*, 6 *not met*, and 6 *not assessable*. T6 checkpoint (letter/word spacing) is evaluated as *partially met* rather than *met* by the same reasoning applied to T7 checkpoint: the fix raised letter spacing, but no word-spacing change exists, so only half of a two-part checkpoint is satisfied. The obtained results are shown in Table 4.

Not every identified issue had its score changed after the remediation step: consent completeness remained *partially met*, since nothing verifies that a parental consent form exists before recording starts, and moving the pull request metadata only narrowed the exposure to a backend readable by any authenticated account, not just the owning teacher (P4 checkpoint). The diagnosis field, even though it was renamed and defaults to “unknown” value, still exists in metadata, and the reading-level rating remained unmodified, so the score for P1 checkpoint remains the same (*not met*). The body font size remained below the 18-point threshold.

Two lessons can be drawn from this audit:

Audit finding	Concrete design change	Effort	Checkpoint source
Diagnosis/reading level embedded in public PR titles/descriptions (P1, P4)	Strip from PR text; keep only in an access-controlled field	High (done)	GDPR Art. 8 [5]; AADC [7]
Consent screen omits the diagnosis/reading-level collection, Art. 9 data per the paper form (P2)	Enumerate every special-category field collected	Low (done)	GDPR Art. 8 [5]; AADC [7]
No mechanism verifies the offline parental consent exists before recording (P2)	Per-student consent attestation at profile creation; block submission without it	Low	GDPR Art. 8 [5]; AADC [7]
Backend read rules gate on authentication only, not teacher role (supp. P4)	Role-based read rules limited to the owning teacher and administrators	Low	AADC [7]; GDPR Art. 8 [5]

Table 3: Main problems identified

Checkpoint	Before	After
T6 – letter/word spacing	Not met	Partial
T7 – line spacing, align	Not met	Partial
C5 – adjustable theme	Not met	Partial
P4 – data sharing	Not met	Partial
Overall (36 ckpts.)	M14/P6/N10/NA6	M14/P10/N6/NA6

Table 4: Checkpoints re-scored after remediation.

- (1) Production maturity and data-protection design are different competencies: the application is mature by ordinary engineering measures, yet none of that maturity reaches the privacy concerns (e.g., a pull request's metadata on an external platform is valid from an engineering point of view, but it fails to meet privacy concerns).
- (2) The way guidelines are transferred to different languages matters. The generic base (British Dyslexia Association guide, Rello and Baeza-Yates studies, WCAG) is built almost entirely from English/Spanish evidence and requires adaptation for other languages (e.g, Romanian).

LIMITATIONS

The evaluation described in this paper is a guideline-based expert audit conducted by the authors, not a study of child users. The authors worked jointly rather than as independent raters, and no outside review was performed. It is also inspection-based, measuring compliance with published guidelines and project documentation rather than any observed effect on a child, with guideline transfer from English/Spanish populations to Romanian. It cannot be considered as independent verification. The findings of applying the proposed checklist to a single application cannot be generalized without additional studies.

CONCLUSIONS AND FUTURE WORK

In this paper, we proposed a reproducible, guideline-based checklist for auditing dyslexia-accessible mobile design to be used before any real-user testing is performed. The checklist was used to evaluate a mobile application meant for recording children reading. The results show that conducting an audit using such a checklist could uncover issues that, otherwise, might be easily missed, especially regarding the handling of

data privacy in applications. The results obtained from auditing after remediation of identified issues demonstrate that the use of such a checklist could drive concrete change (not just scoring), and if the audit is run before deployment, it could uncover data privacy exposure paths before any data is actually saved. Also, the proposed checklist and audit, inexpensive and needing no child participants, might be reused by other teams designing dyslexia-accessible mobile applications. Future work consists of performing more studies on using the proposed checklist on different mobile applications, focusing on apps targeting children, and developing and evaluating the reading tutor assistant tool that inspired the proposal of this checklist.

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The Complete Checklist

No	ID	Checkpoint (generic wording)	Primary source
1	T1	Body text uses a sans-serif, non-decorative typeface; where the target language has diacritics with a contested glyph history, the correct modern forms render rather than a visually similar substitute (Romanian adaptation: comma-below ș/ț, not cedilla)	BDA Style Guide [2]
2	T2	Body font size is at least 18-point-equivalent on screen	BDA Style Guide [2]; Rello et al. [15]; Rello & Baeza-Yates [13, 14]
3	T3	Headings are at least 20% larger than body text	BDA Style Guide [2]
4	T4	Italics and underlining are avoided for emphasis; bold is used instead	BDA Style Guide [2]
5	T5	All-caps and small-caps are avoided for body/instructional text	BDA Style Guide [2]
6	T6	Letter and word spacing are increased over default, in the range empirically shown to reduce fixation duration	BDA Style Guide [2]; Rello & Baeza-Yates [13, 14]
7	T7	Line spacing is at least 1.5×; body text is left-aligned, never justified	BDA Style Guide [2]
10	C2	Background avoids pure white; a cream, off-white, or soft pastel background is used, or is user-selectable	BDA Style Guide [2]; Rello & Baeza-Yates [13, 14]
11	C3	Colour choice never relies on a green/red (or red/pink) distinction alone to convey state	BDA Style Guide [2]
12	C4	Backgrounds behind text are flat and non-patterned; no text sits over busy imagery	BDA Style Guide [2]
13	C5	The foreground/background colour scheme is user-adjustable (a theme or reading-mode control)	BDA Style Guide [2]; WCAG 2.2 [17]
14	C6	Text resizes up to 200% (OS-level font scaling) without loss of content or function	WCAG 2.2 SC 1.4.4 [17]
15	N1	All interactive targets are at least 24×24 CSS px, or spaced so the effective touch area meets this	WCAG 2.2 SC 2.5.8 [17]
16	N2	Navigation is shallow and consistent, with fixed back/home placement across screens	BDA Style Guide [2]; Alsumait & Al-Osaimi [1]
17	N3	Text input is minimized in favor of tap/select/drag interactions appropriate to the user's motor and spelling ability	Alsumait & Al-Osaimi [1]
18	N4	Reading/exercise flows avoid unnecessary forced time pressure (no non-optional countdown on a reading task)	Alsumait & Al-Osaimi [1]
19	N5	Long content is chunked into short sections with visible progress; where a reading surface exists, chunking follows the target language's natural reading unit (Romanian adaptation: syllable-level, given its simple CV/CVC structure)	BDA Style Guide [2]; Alsumait & Al-Osaimi [1]
20	N6	Layout is single-column and left-aligned; no multi-column ("newspaper") text flow	BDA Style Guide [2]
21	M1	Text-to-speech/read-aloud is available for instructions and any reading passages	BDA Style Guide [2]; Alsumait & Al-Osaimi [1]
22	M2	Where audio narration exists, it is paired with synchronized visual highlighting of the corresponding text	Design corollary of text to speech provision; no single named source specifies this as a hard checkpoint
23	M3	Images/icons support rather than merely decorate text; pictograms are used consistently to aid navigation	BDA Style Guide [2]
24	M4	Where the app has child-facing instructional audio/visual content, its audio and visual channels can each be muted/adjusted independently	General multimodal-accessibility corollary of BDA and WCAG's user-control philosophy; no single named source mandates this for every use case

No	ID	Checkpoint (generic wording)	Primary source
25	F1	System status/progress is always visible; where fluency/pace is diagnostically relevant, a pacing signal counts as first-class status feedback (Romanian adaptation: fluency reweighting)	Nielsen & Molich [10]; Alsumait & Al-Osaimi [1]
26	F2	Errors are communicated without punitive language or imagery; a corrective path is always offered	Alsumait & Al-Osaimi [1]; BDA Style Guide [2]
27	F3	Instructions and feedback use short, simple, active-voice sentences, avoiding double negatives and unexplained abbreviations	BDA Style Guide [2]
28	F4	Help is available in context (e.g., an in-task hint) rather than requiring the user to leave the task	Alsumait & Al-Osaimi [1]
29	G1	Curiosity/exploration appropriate to age is supported (e.g., optional exploratory content) without penalizing it	Alsumait & Al-Osaimi [1]
30	G2	Difficulty/challenge level is appropriate to the target age/reading level and adjustable	Alsumait & Al-Osaimi [1]; WCAG 2.2 SC 3.1.5 [17]
31	G3	A reward/progress system reinforces effort and completion, not only correctness	Alsumait & Al-Osaimi [1]
31	G4	Session length/pacing is bounded to realistic attention spans, with a natural stopping point	Alsumait & Al-Osaimi [1]
33	P1	Data-collection defaults are the most privacy-protective option available; no data is requested beyond what the task needs	ICO Age Appropriate Design Code [7]
34	P2	Where a user is below the relevant age of digital consent, processing requires verifiable parental/guardian consent	GDPR Art. 8 [5]
35	P3	No behavioural profiling, targeted advertising, or nudge technique is directed at the child user	ICO Age Appropriate Design Code [7]
36	P4	Data shared with a supervising adult/institution is limited to what is pedagogically necessary and disclosed transparently	ICO Age Appropriate Design Code [7]