Provenance-aware multimodal resource organization for smart library wellbeing services: A data-driven study of bibliotherapy-informed recommendations

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Abstract

Purpose: This study examines how the openly shared tabular portion of a publicly archived corpus of bibliotherapy-informed recommendations can be independently re-annotated and reorganized into a provenance-aware and media-sensitive framework for smart library wellbeing services. Methods: The analytical corpus comprises 391 unique resources and 447 source-occurrence records, all traceable to the publicly archived data package of X. Wang et al. (2026b). Target groups, seven problem categories, media types, and provenance layers were analyzed using descriptive statistics, contingency analysis, adjusted standardized residuals with Holm correction, correspondence analysis, and robustness checks. Results: Problem category was associated with media type (chi-square = 167.37, df = 24, $p < 0.001$; Cramer's V = 0.327). The association persisted after excluding all 108 records recoded from pending or mixed categories (chi-square = 170.99; V = 0.389), after excluding 18 reliability-sample items for which both coders agreed with each other but differed from the archived analytic label (chi-square = 167.18; V = 0.335), and after replacing those 18 labels with the coders' consensus assignments (chi-square = 168.25; V = 0.328). The strongest stable positive configurations linked anxiety and stress with books and music, growth and life education with films, and self-identity and personal value with picture books. An 80-item independent audit showed high inter-coder agreement (90.0%; Cohen's kappa = 0.880), while agreement with the frozen analytic field was lower (72.5% and 70.0% for the two coders). Conclusion: The study demonstrates a transparent re-annotation workflow for organizing a non-probability tabular subset of bibliotherapy-informed resources while making provenance, classification uncertainty, and corpus-construction effects visible. The framework is intended for non-clinical, human-reviewed smart library wellbeing services rather than therapeutic decision making.

Keywords: Smart libraries; Bibliotherapy-informed resources; Library wellbeing services; Multimodal resource organization; Provenance-aware recommendation; Media-problem fit

1. Introduction

Libraries are increasingly recognized as public knowledge infrastructures that support not only information access and learning, but also social inclusion, cultural participation, and public wellbeing. In recent years, psychological stress, loneliness, anxiety, and other wellbeing-related concerns have become important issues in community and educational contexts. Against this background, reading-based support, bibliotherapy, and wellbeing collections have received renewed attention in library and information science (Fan, 2022; Feng and Li, 2024; Grimes, 2024; Hill

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and Cox, 2024; Wang, 2007). These practices do not position libraries as clinical treatment providers. Rather, they emphasize the non-clinical value of books, picture books, films, music, and other cultural resources in emotional support, self-reflection, social connection, and meaning-making.

Bibliotherapy has long been discussed as a method of using reading materials to support psychological adjustment and personal growth (Wang, 2007; Yu and Mou, 2019). In library settings, this tradition has gradually evolved from individual reading guidance to more organized forms of public service, such as mental health reading lists, wellbeing collections, and community-based reading support programs (Grimes, 2024; Hill and Cox, 2024; Mou and Yu, 2021, 2023). Library-based wellbeing services have also expanded beyond printed books. Picture books, films, music, and other multimodal resources are increasingly used to support users with different cognitive, emotional, and situational needs (Hamilton, 2024; Lu et al., 2021). This expansion creates new opportunities for library services, but it also raises questions about how such resources should be described, organized, evaluated, and recommended.

Despite the growing availability of bibliotherapy-informed recommendations, many existing practices still rely on loosely structured reading lists or thematic collections. These lists are useful for public promotion, but they are often insufficient for smart library services that require structured metadata, explainable recommendation, and scenario-based resource integration. A resource may be recommended because it is supported by empirical research, endorsed by experts, or widely accepted by the public. Similarly, a resource may be suitable for anxiety, loneliness, self-identity, growth, trauma, or social adaptation, and it may take the form of a book, picture book, film, music work, or another media type. If these dimensions are not systematically coded and compared, libraries may find it difficult to explain why a resource is recommended, for whom it is suitable, and in what service context it should be used.

Existing research has provided valuable insights into bibliotherapy, reading promotion, mental health support, and wellbeing collections. However, three gaps remain. First, most studies focus on service models, intervention effects, or selected cases, while the internal structure of publicly available bibliotherapy-informed recommendations has received less systematic attention. Second, multimodal resources are increasingly acknowledged, but the relationship between wellbeing-related problem categories and media configurations has rarely been statistically examined. Third, recommended resources enter public circulation through different provenance channels, including empirical studies, expert or professional recommendations, and public recommendation platforms. These channels reflect different mechanisms of selection and visibility, but they are seldom transformed into comparable provenance metadata for resource organization and evaluation.

These gaps are particularly important for smart libraries. In a smart library context, the challenge is not simply to collect more wellbeing-related resources, but to organize them in ways that are machine-readable, provenance-aware, and explainable to both librarians and users. Structured metadata about target groups, problem categories, media types, source provenance, and use scenarios can support personalized recommendation, human-AI collaborative curation, and transparent service design. For example, if anxiety-related resources are more strongly associated with books and music, while growth-related resources are more strongly associated with films, such patterns can inform the design of scenario-based resource packages.

This study addresses these issues by examining publicly available bibliotherapy-informed recommendations from the perspective of resource organization. In this study, bibliotherapy-informed wellbeing resources refer to books, picture books, films, music, and related cultural resources recommended for emotional support, psychological adjustment, personal growth, and meaning-making in library or public knowledge-service contexts. Rather than treating these resources as a simple collection of reading lists, this study conceptualizes them as a structured resource system composed of target groups, problem categories, media types, and source-provenance layers.

The study is guided by the following research questions:

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- RQ1: What are the target-group and problem-category distributions of publicly available bibliotherapy-informed resources?
- RQ2: Are problem categories significantly associated with media configurations?
- RQ3: How do different source-provenance layers differ in media distribution and problem coverage?

This study makes three contributions. Theoretically, it extends bibliotherapy and library wellbeing research from service practice to the internal organization of recommended resources. Methodologically, it independently re-annotates and reorganizes an existing public archive into a two-level resource-source structure, operationalizes media-problem fit and provenance metadata, preserves coding and source audit trails, and subjects the resulting associations to reliability, multiplicity, recoding, known-divergence, provenance-stratified, exact-test, and missingness checks. Practically, it provides a metadata-oriented framework for smart library wellbeing services, explainable recommendation, and human-reviewed resource curation. The contribution is therefore analytical re-annotation and transparent resource organization, not the creation of a wholly new underlying resource corpus.

2. Literature Review

2.1 Bibliotherapy and Library-Based Wellbeing Services

Bibliotherapy generally refers to the purposeful use of reading materials to help individuals understand personal difficulties, regulate emotions, develop coping strategies, and construct meaning through guided or self-directed reading (Wang, 2007; Yu and Mou, 2019). Although bibliotherapy has roots in clinical, educational, and counseling contexts, libraries have played an increasingly important role in translating this approach into public, accessible, and non-clinical wellbeing services (Grimes, 2024; Mou and Yu, 2021, 2023).

In library and information science, bibliotherapy is closely related to reading promotion, reader advisory services, mental health information services, and community wellbeing initiatives. Library-based bibliotherapy does not aim to replace professional psychological counseling or medical treatment. Instead, it offers a low-threshold form of cultural and informational support by connecting users with suitable resources (J. Wang, 2021; X. Wang and Xu, 2021; X. Wang et al., 2023a).

Previous studies have shown that library-based reading support has been applied to different user groups, including university students, adolescents, older adults, and special support populations (Abidin et al., 2023; Liao et al., 2025; Monroy-Fraustro et al., 2021; J. Wang, 2021; X. Wang and Xu, 2021; X. Wang et al., 2023a; X. Wang et al., 2023b). Wellbeing collections in academic libraries have expanded the scope of library services from disciplinary learning to psychological and emotional support (Hill and Cox, 2024). However, much of the existing work still treats bibliotherapy-related resources as reading lists or thematic collections. Such practices are useful for service promotion, but they often lack structured metadata that can support comparison, explanation, recommendation, and reuse.

2.2 Multimodal Resources and Media-Problem Fit

Traditional bibliotherapy has often been associated with books and written texts. However, contemporary reading-based wellbeing services increasingly involve multiple media types, including picture books, films, music, musicals, and other audiovisual resources. This multimodal expansion reflects changes in both user needs and cultural consumption patterns.

Different media types may support wellbeing in different ways. Books can provide conceptual explanation, reflective distance, and sustained cognitive processing. Picture books combine text and images, often reducing cognitive load while enabling symbolic expression and emotional resonance. Films offer narrative immersion, character identification, and emotional simulation. Music can provide immediate emotional regulation, sensory soothing, and companionship, especially in contexts involving anxiety, stress, sadness, or loneliness (Hamilton, 2024; Lu et al., 2021).

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Despite this potential, the relationship between problem categories and media types has not been sufficiently examined in library and information science. Existing studies often acknowledge the importance of multimodal resources, but many remain descriptive or practice-oriented. The concept of media-problem fit is therefore useful for understanding bibliotherapy-informed resource organization. It refers to the possibility that different media types may have different functional advantages in different wellbeing-related problem contexts.

2.3 Provenance-Aware Organization and Smart Library Services

A distinction should be drawn at the outset between provenance and evidential strength. Provenance describes the route through which a resource entered the reconstructed recommendation corpus: a public platform, an expert or professional recommendation, or a research publication. Evidential strength describes how convincingly a wellbeing effect has been demonstrated and depends on study design, sample size, comparison conditions, outcome measurement, and replication. The two are not interchangeable. The present study codes provenance only. It does not rate the therapeutic evidence for individual resources, and the three provenance categories used here are unordered nominal source categories rather than a hierarchy of quality.

Another important issue in bibliotherapy-informed resource organization concerns provenance. Publicly available wellbeing-related recommendations are not homogeneous in how they enter circulation. Some records originate in empirical studies, intervention programs, journal articles, dissertations, or monographs. Some arise from experts, professional institutions, psychological organizations, or authoritative platforms. Others circulate through public platforms, user ratings, and popular cultural discussions.

In practice, these different source routes are often mixed within the same reading list or recommendation system without being explicitly identified. A title discussed in an empirical study, a title endorsed by a practitioner, and a title popular among general users may all be presented simply as recommended resources. When provenance is hidden, users and librarians cannot distinguish research use, professional judgement, and public visibility, which reduces the transparency and interpretability of recommendation.

Provenance-aware organization therefore does not mean ranking resources on a single scale. Public recommendations may reflect accessibility, acceptability, cultural resonance, or visibility. Expert recommendations may reflect professional screening, domain knowledge, and practice-based judgement. Empirical-study records indicate documented research use or intervention-related discussion. These source functions are different, but none is treated here as inherently superior to the others.

This perspective is highly relevant to smart library research. Smart libraries increasingly rely on structured data, knowledge organization, artificial intelligence, and recommendation technologies to improve service precision and user experience (X. Wang et al., 2026a). In wellbeing-related services, recommendation cannot be based only on popularity or textual similarity. Libraries also need to consider whether a resource is appropriate for the target group, whether it corresponds to the problem context, whether the media type fits the service scenario, and what provenance information accompanies the recommendation.

3. Methods

3.1 Research Design

This study adopted a quantitative content analysis design combined with descriptive statistics and contingency analysis. The aim was to examine how publicly available bibliotherapy-informed wellbeing resources are distributed across target groups, problem categories, media types, and source-provenance layers, and to identify whether systematic associations exist among these dimensions.

The study did not evaluate the clinical effectiveness of individual resources. Instead, it focused on the organizational structure of publicly available recommendations. The unit of analysis was not a user, a patient, or an intervention outcome, but a recommended cultural resource and its associated source records.

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The analysis was conducted at two levels. The first level was the source occurrence record, which preserved each appearance of a resource in a specific source. This level was used to identify source frequency, provenance-layer coverage, and cross-source recurrence. The second level was the unique resource record, in which duplicated resources were consolidated into a single resource entry. This level was used for the main analyses of target groups, problem categories, media types, and source-provenance layers.

3.2 Data Sources and Sample Construction

Data source and relationship to prior work. The analytical corpus was derived entirely from the publicly accessible data package archived by X. Wang et al. (2026b) under handle 20.500.12304/13242 and associated with their multimodal knowledge-graph study of reading-based wellbeing resources (X. Wang et al., 2026a). The archived package contains six worksheets of recommendation records together with sample documents describing resource-selection criteria and empirical and expert source lists. Title-standardized cross-checking against the archived materials confirmed that all 391 unique resources analyzed here trace to that package; the present study collected no additional resource records from outside it.

The relationship to the prior work is one of independent re-annotation and reorganization rather than independent data collection. The archive supplies resource titles, free-text problem descriptions, selection criteria, and source labels distributed across separate worksheets. The present study consolidates those records into a two-level resource-source structure, deduplicates them into unique resources and source occurrences, derives the target-group, seven-category problem, grouped-media, and provenance-layer variables used in the analyses, and preserves the recoding and provenance audit trail. The present authors were not involved in creation of the archived dataset. The analytical contribution therefore lies in the re-annotation, resource organization, and new statistical questions rather than in dataset-level novelty.

A consequence of this derivation constrains how the provenance analyses should be interpreted. In the archived package, records are organized by worksheet, and most worksheets are largely homogeneous in both medium and source channel: three worksheets contain picture-book records, one is dominated by books from expert or platform recommendations, one contains music records, and one contains a themed film list. For most records, media type and provenance layer are therefore jointly determined by worksheet of origin rather than independently sampled attributes. The provenance-by-media contingency structure reported in Section 4.5 is accordingly treated as a corpus-structure audit, not as an empirical regularity about how provenance categories intrinsically prefer particular media.

The archived package distinguishes the complete resource inventory from the tabular worksheets and sample documents used in the present analysis. According to the package documentation, the complete archive contains 1,532 resource instances, whereas consolidation of the openly shared tabular portion yielded the 391 unique resources analyzed here. By simple count this is roughly one quarter of the complete archive, but it should not be interpreted as a formal sampling fraction because the units and release process are not identical. The shared tabular portion was not generated by any probability-sampling procedure documented to us; it reflects the worksheets and examples made openly available by the original data creators. The present study therefore treats the 391-resource corpus as a non-probability convenience subset of the archive. Descriptive distributions reported below characterize this tabular portion and should not be generalized to the full 1,532-instance inventory.

The inclusion criteria were: (1) source provenance could be identified at least at the level of a publication, platform, reconstructed list, or preserved source carrier; (2) the resource name was sufficiently identifiable for standardization; (3) the record contained a wellbeing-related problem orientation, support goal, or recommendation context; (4) the source could be assigned to one of the three source-provenance categories used in the analysis; and (5) the media type could be determined. Records were excluded when the resource identity remained ambiguous, the problem orientation or recommendation context could not be established, or the source-provenance category or media type remained indeterminate after manual verification. Traceability

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was not uniform in granularity: some occurrence records retained platform-, list-, or workbook-sheet-level provenance rather than a complete bibliographic citation. These limitations and unresolved markers were preserved in the supplementary occurrence table rather than silently upgraded to stronger provenance claims.

After data cleaning, standardization, deduplication, and manual verification, the final dataset contained 447 source occurrence records and 391 unique resources. Source occurrence records were retained to represent recurrence across preserved sources, while unique resource records were used as the primary analytical unit for resource structure. Publication or release year could be identified for 151 of the 391 unique resources; occurrence-level recommendation or source dates could not be reconstructed consistently from the preserved source records. The cleaned master table, source occurrence table, coding manual, recoding audit log, statistical tables, and reviewer-facing robustness audits were prepared as supplementary materials.

At the occurrence level, the preserved archive contains 23 source-title/platform combinations after reconstruction. The major streams correspond directly to the archived workbook structure: three picture-book worksheets (61, 52, and 55 archived records before resource-level consolidation), an expert-recommendation book worksheet (69), a music worksheet (73, comprising expert and empirical records), and a themed-film worksheet (100 selected films in the archived sheet). The archive's accompanying source-list document also supports the attribution of the three reconstructed picture-book streams that were previously marked as inferred; Supplementary Table S3 records this upgrade while preserving any remaining granularity limits. Publication or release year can be identified for 151 of the 391 unique resources. Because the archived working files do not preserve a complete retrieval-window log for all source streams, retrieval dates are not retrospectively invented.

3.3 Deduplication and Resource Identification

Because the same resource could appear in multiple sources, deduplication was conducted to distinguish between repeated source occurrences and unique resource entries. Resources with the same title and the same media type were merged when they referred to the same work. Resources with the same title but different media types were retained as separate resource entries. For example, a book and a film with the same title were treated as different resource units if they represented different media forms. Resources with similar or identical titles but different versions, authors, editions, or carriers were manually checked to determine whether they should be merged or separated.

This procedure preserved source recurrence while avoiding inflated counts in the main structural analysis. Each unique resource was assigned a unique resource identifier, and all corresponding source occurrence records were linked to that identifier.

3.4 Coding Framework and Variables

A four-layer coding framework was developed for the analysis: basic identification, thematic classification, source-provenance classification, and relational mapping. The basic identification layer recorded resource title, media type, source name or carrier, resource publication or release year where available, and other contextual information. The thematic layer retained original problem text, secondary problem labels, target-group information, and a final first-level problem category for analysis. Because some resources were associated with more than one problem descriptor, the raw and secondary labels were preserved rather than overwritten. For the contingency analyses, however, one mutually exclusive primary problem category was required for each unique resource; 108 records originally marked as unclear, pending, or mixed were reassigned using the documented coding rules. This mutually exclusive field is an analytical simplification rather than a claim that a resource can address only one wellbeing-related problem. The relational layer linked unique resource identifiers to source occurrences, media types, provenance categories, target groups, and coding traces.

Table 1. Coding framework and analytical variables

Variable group	Main variable	Coding categories / examples	Analytical use

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Variable group	Main variable	Coding categories / examples	Analytical use
Basic identification	Resource title, source, year	Title, source name, carrier, recommendation or publication year where available	Resource identification and source traceability
Target group	User group	Adults, university students, adolescents, older adults, cross-group users, special support groups	Target-group distribution and service scenario analysis
Problem category	First-level category	Depression/low mood/loneliness; anxiety/stress; growth/life education; behavioral regulation/functional support; self-identity/personal value; interpersonal/social adaptation; trauma/illness/special situations	Problem structure and media-problem fit analysis
Media type	Resource form	Books, picture books, films, music, musicals, other or uncertain multimodal resources	Media distribution and contingency analysis
Source provenance	Source-provenance layer	Public recommendations, expert recommendations, empirical studies	Source-structure comparison and recommendation transparency
Relational mapping	Resource-source links	Unique resource ID linked to source occurrence records and coded variables	Cross-source recurrence and cross-layer analysis

3.4.1 Coding Decision Rules

Each interpretive dimension was coded using a dominant decision rule while preserving the original source text, secondary descriptors, and audit notes. These rules are used to make the analytical categories interpretable and reproducible; they do not imply that the underlying resources themselves are naturally mutually exclusive. The reliability audit identified two problem-category boundaries that had been underspecified in the archived analytic field. The clarifications below were therefore documented after that audit. To avoid selective post-hoc rewriting of the primary dataset, the frozen analytic field was not silently overwritten; instead, the impact of the known divergent items is reported in explicit sensitivity analyses (Section 4.6).

Target group. The six-label target-group variable is a derived field rather than a flat set of logically disjoint categories. Two underlying dimensions are retained in the supplementary master table: life stage (adolescents, university students, adults, and older adults) and a need-based special-support attribute, together with a multi-audience marker. Mutual exclusivity is achieved by a fixed precedence rule. A record carrying a substantive special-support attribute is coded as a special support group irrespective of life stage; a record explicitly addressed to two or more audiences without prioritization is coded as cross-group; otherwise the most specific life-stage label is used, so that university students are coded as university students rather than absorbed into the broader adult category. This precedence was exercised in 7 of the 391 records, all of which carried an adult life-stage code together with a special-support attribute. The supplementary Target_Group_Derivation_Audit

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reproduces the final target-group field from the retained life-stage and special-support fields with 0 of 391 mismatches. No independent agreement coefficient is claimed for this dimension.

Problem category. The dominant criterion is the primary support goal expressed in the preserved recommendation or problem text, not the general subject matter of the work. Two boundary rules were made explicit after inspection of the 18 reliability-sample cases in which both coders agreed with each other but differed from the archived analytic label. Rule R1 (emotional state versus relational or situational context): when a record names both an emotional state and the context in which it arises, the stated support goal governs the assignment. Loneliness or low mood following a relational event is coded to depression/low mood/loneliness when the feeling itself is the target; interpersonal/social adaptation is used when relating to others - such as friendship, conflict, empathy, or group belonging - is itself the support goal; trauma/illness/special situations is used when the circumstance itself is the target. Rule R2 (behavioral regulation is not a residual category): behavioral regulation/functional support is assigned only when a specific behavior, habit, or functional capacity - for example procrastination, concentration, willpower, time management, sleep, or addiction-related behavior - is explicitly the object of support. General or difficult-to-place records are not placed in this category by default. Original problem text, the archived analytic label, and all 108 pending/mixed recoding traces remain preserved.

Provenance layer. Provenance is an unordered nominal description of the selection channel represented by the archived record - public recommendation, expert/professional recommendation, or empirical study - rather than a measure of therapeutic evidential strength. Because the archived worksheets themselves organize most records by media and source stream, the provenance variable is used primarily for transparency and corpus-structure audit. Occurrence-level appearances are retained; for unique-resource analyses the archived main-layer field is used. Only one of 391 resources appears across two provenance layers.

Audit boundary. Source granularity is preserved as recorded rather than retrospectively upgraded beyond what the archive supports. The reliability statistics reported in Section 3.7 apply only to the final problem-category dimension; target group, media type, and provenance layer were not subjected to the same independent double-coding procedure.

3.5 Provenance Layers and Cross-Layer Recurrence

To avoid implying a hierarchy of evidential strength, the three categories referred to in earlier drafts as evidence layers are treated operationally here as source-provenance layers. Public recommendations, expert recommendations, and empirical studies describe different routes through which resources entered the reconstructed corpus. Public recommendations mainly capture cultural visibility, user attention, or public resonance; expert recommendations capture professional or practice-based selection; empirical studies capture documented research use or intervention-related discussion. These categories therefore indicate provenance and selection context, not clinical effectiveness, causal evidence strength, or a universal ranking of resource quality.

Cross-layer recurrence was calculated as the number of distinct provenance layers in which each unique resource appeared. This quantity had originally been considered as an Evidence Consistency Index, but the observed distribution provides essentially no basis for ranking: 390 of 391 resources appeared in one provenance layer, one resource appeared in two layers, and none appeared in all three. The legacy index is therefore retained only as an audit field. In the manuscript it is reported as a near-zero cross-layer recurrence result, not as a measure of evidential strength or corroboration.

3.6 Statistical Analysis

Descriptive statistics were first used to summarize unique resources, source occurrences, cross-source recurrence, media types, source-provenance layers, target groups, problem categories, and year availability.

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Contingency analyses examined problem category by grouped media type, source-provenance layer by media type, and source-provenance layer by problem category. Pearson's chi-square test was used for the primary categorical association tests; extremely low-frequency media categories were grouped as Other for the problem-by-media table. Cramer's V was reported as an effect-size measure. Adjusted standardized residuals (ASRs) were used for cell-level follow-up. For reviewer-facing interpretation, |ASR| >= 2.58 was used as a conservative screening threshold, exact two-sided normal-approximation p-values were calculated for all 35 cells in the 7 x 5 problem-by-media table, and Holm adjustment was applied across those 35 comparisons. Correspondence analysis was used descriptively to visualize the contingency structure. Because the provenance-by-media table contained three cells with expected frequencies below five, that association was also checked with a Monte Carlo Fisher exact test using 100,000 resamples (random seed 20260811).

Four robustness checks were conducted for the revision. First, the problem-by-media analysis was repeated after excluding all 108 records whose final problem category had been recoded from an originally pending or mixed category. Second, after the 80-item reliability audit identified 18 cases in which both coders agreed with each other but differed from the archived analytic label, the problem-by-media analysis was repeated (a) after excluding those 18 cases and (b) after substituting the coders' consensus label for those 18 cases as a post-hoc sensitivity analysis; the frozen primary analytic field remained unchanged. Third, problem labels were permuted 50,000 times within provenance layers (random seed 20260811) to assess whether the overall media-problem association was stronger than expected from provenance composition alone; the Monte Carlo p-value was calculated as (exceedances + 1)/(permutations + 1). Fourth, year-identifiability was cross-tabulated with provenance layer, grouped media type, problem category, and target group to assess structural missingness.

3.7 Quality Control

Several quality-control procedures were used. A coding manual defined target groups, final problem categories, media types, and source-provenance categories. Ambiguous records were reviewed against preserved problem descriptions, source contexts, platform labels, and resource introductions. Resource titles, media types, source carriers, and duplicate relationships were checked manually. The source-occurrence table was cross-checked against the resource master table, and the revised dataset retained both original and final problem-category fields so that all 108 rule-based recoding decisions remained auditable.

To assess the reliability of the final problem-category coding, an independent double-coding check was completed on a stratified random subsample of 80 unique resources. Two senior research librarians, Zhang Chunlei and Meng Hong, independently assigned each sampled resource to one of the seven final problem categories using a worksheet from which the reference labels had been removed. They did not consult one another during coding, and the exercise was conducted more than 90 days after the original corpus coding. Observed agreement was 90.0% (72/80); expected agreement from the coders' marginal distributions was 0.169; Cohen's kappa was 0.880 (SE = 0.040; 95% CI 0.801-0.959). The eight inter-coder disagreements were distributed across picture books (3), music (3), and films (2).

Because this was a retrospective audit, it also provides a stricter comparison between independent application of the current coding rules and the archived analytic field actually used in the contingency analyses. Coder A reproduced that field in 72.5% of cases (58/80) and Coder B in 70.0% (56/80). In 18 of the 80 items, both coders agreed with each other but differed from the archived analytic label. This divergence was most visible for picture books: inter-coder agreement was 0.900 (27/30), whereas Coder A's agreement with the archived analytic field was 0.600 (18/30). The corresponding analytic-field agreement values were 0.842 for films, 0.733 for books, and 0.812 for music. Divergence was not confined to the 108 recoded records (8/22 recoded versus 10/58 unchanged within the reliability sample; Fisher exact p = 0.080), although the direction warrants caution.

We report both types of agreement because they answer different questions. Cohen's kappa describes whether two analysts using the present manual make consistent judgements; agreement with the archived analytic field

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describes how faithfully that frozen field reflects those rules and is the more conservative indicator of what the seven-category variable can support. Supplementary Table S6 provides all 80 item-level assignments, written rationales, the 18 consensus-versus-reference divergences, and summary statistics. These reliability results apply only to the final problem-category field.

3.8 Ethical Considerations

This study analyzed publicly available resource recommendations and did not involve personal user data, clinical records, private communications, or human subjects. The resources discussed in this study are intended for non-clinical reading guidance, cultural support, and library-based wellbeing services. They should not be interpreted as substitutes for professional psychological counseling, psychiatric diagnosis, or medical treatment. When libraries implement wellbeing-related resource services, clear ethical boundaries should be maintained, and users with high-risk mental health needs should be referred to appropriate professional services.

4. Results

4.1 Overall Sample Characteristics

After data cleaning, standardization, deduplication, and manual verification, the final dataset contained 391 unique resources and 447 source occurrence records. Among the 391 resources, 351 appeared in only one preserved source and 40 appeared in two or more sources. Only one resource appeared across more than one source-provenance layer. Resource publication or release year was identifiable for 151 resources (38.6%), leaving 240 with missing year information. These figures indicate substantial source dispersion and limited cross-layer convergence.

Table 2. Overall sample structure

Indicator	Frequency	Percentage / note
Unique resources	391	100.0%
Source occurrence records	447	Occurrence-level records
Resources appearing in only one source	351	89.8%
Resources appearing in two or more sources	40	10.2%
Cross-provenance-layer resources	1	0.3%
Resources with identifiable year information	151	38.6%

Within the analyzed tabular portion of the archive, the media distribution was not limited to traditional books. Picture books were the largest media category, followed by films, books, and music. These proportions describe the openly shared convenience subset used for re-annotation and should not be read as estimates of the full 1,532-instance archive.

Table 3. Distribution of media types

Media type	Frequency	Percentage
Picture books	130	33.2%
Films	102	26.1%
Books	81	20.7%
Music	76	19.4%
Musicals	1	0.3%

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Media type	Frequency	Percentage
Multimodal/uncertain	1	0.3%

In terms of source provenance, empirical-study records accounted for the largest share, followed by expert recommendations and public recommendations. This distribution describes the composition of the reconstructed source streams rather than an evidence-strength ranking.

Table 4. Distribution of source-provenance layers

Source-provenance layer	Frequency	Percentage
Empirical studies	152	38.9%
Expert recommendations	138	35.3%
Public recommendations	101	25.8%

4.2 Target Group Distribution

Within the analyzed tabular portion, the target group distribution was mainly oriented toward adult users. Adult-oriented resources accounted for 239 records (61.1%), university student resources for 48, adolescent resources for 39, older adult resources for 35, cross-group resources for 23, and special support group resources for 7. These six mutually exclusive labels are produced by the precedence rule stated in Section 3.4.1 rather than by assuming that age- and need-based categories are inherently disjoint. Because the corpus is a convenience subset of the archive and year information is incomplete, these counts are interpreted only as structural properties of the analyzed portion.

Table 5. Distribution of target groups

Target group	Frequency	Percentage
Adults	239	61.1%
University students	48	12.3%
Adolescents	39	10.0%
Older adults	35	9.0%
Cross-group users	23	5.9%
Special support groups	7	1.8%

4.3 Problem Category Distribution

After reviewing and recoding unclear or mixed problem labels based on original problem descriptions, source contexts, platform labels, and resource introductions, seven first-level problem categories were identified. The largest category was depression, low mood, and loneliness, followed by anxiety and stress. The results indicate a dual-core structure: one core consists of emotional support issues, and the other consists of developmental and meaning-oriented issues.

Table 6. Distribution of problem categories

Problem category	Frequency	Percentage
Depression, low mood, and loneliness	100	25.6%
Anxiety and stress	77	19.7%
Growth and life education	55	14.1%

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Problem category	Frequency	Percentage
Behavioral regulation and functional support	50	12.8%
Self-identity and personal value	49	12.5%
Interpersonal and social adaptation	43	11.0%
Trauma, illness, and special situations	17	4.3%

4.4 Association Between Problem Categories and Media Types

A contingency analysis was conducted between problem category and media type. Extremely low-frequency media categories were combined into an "Other" category for statistical testing. Based on the revised final seven-category problem schema, the results showed a significant association between problem category and media type (chi-square = 167.37, df = 24, $p < 0.001$). The effect size was moderate, with Cramer's V = 0.327. This indicates that media types were not randomly distributed across problem categories.

Cell-level follow-up identified five positive problem-media combinations that met the |ASR| >= 2.58 screening rule and remained significant after Holm correction across all 35 cells: growth and life education with films; anxiety and stress with music; anxiety and stress with books; self-identity and personal value with picture books; and interpersonal and social adaptation with picture books. The corresponding Holm-adjusted p-values were <0.001, <0.001, <0.001, 0.044, and 0.025, respectively. Table 7 reports these positive cells, while the complete residual matrix, including negative residuals, exact p-values, and Holm-adjusted p-values, is provided in the supplementary data.

Table 7. Overrepresented problem-media combinations based on adjusted standardized residuals

Problem category	Overrepresented media type	Frequency	Adjusted standardized residual
Growth and life education	Films	35	6.84
Anxiety and stress	Music	34	6.12
Anxiety and stress	Books	31	4.72
Self-identity and personal value	Picture books	26	3.15
Interpersonal and social adaptation	Picture books	24	3.33

In the full-sample analysis, anxiety and stress were overrepresented in books and music, growth and life education in films, and self-identity and personal value in picture books. Interpersonal and social adaptation was also overrepresented in picture books in the full sample, although this last pattern did not remain stable when all 108 recoded records were excluded (Section 4.6). The media-problem results are therefore interpreted as structural associations in the reconstructed corpus rather than as evidence that one medium is intrinsically superior for a given wellbeing problem.

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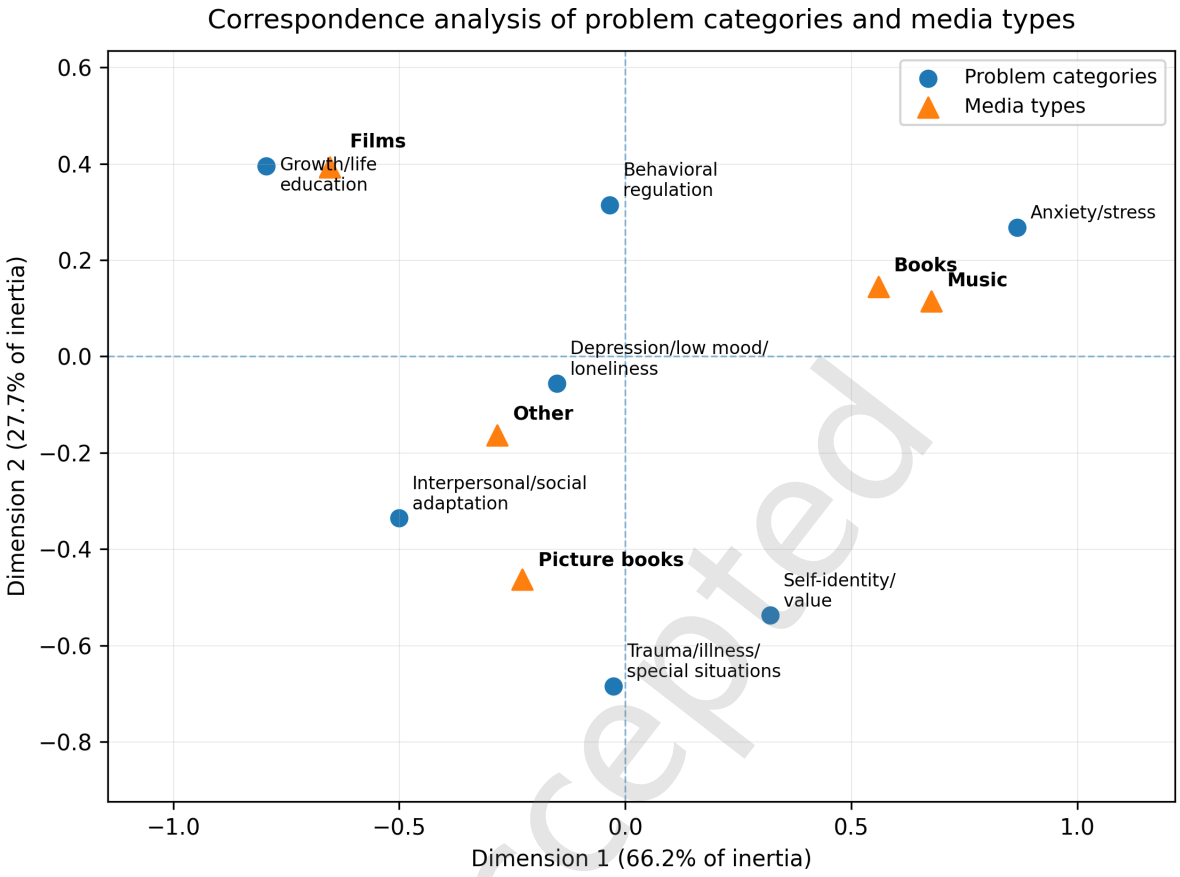


Figure 1. Correspondence analysis of problem categories and media types. Proximity between labels indicates stronger correspondence in the contingency structure. Dimension 1 and Dimension 2 explain 66.2% and 27.7% of the total inertia, respectively.

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4.5 Source-Provenance Layers, Media Distribution, and Problem Coverage

The numerical relationship between provenance layer and media type was very strong (chi-square = 668.67, df = 8, $p < 0.001$; Cramer's V = 0.925), but it is not treated as an empirical source-preference finding. The archived package is organized by worksheet, and five of the six principal worksheets map to a single dominant medium-provenance combination; for most records, medium and provenance were therefore jointly inherited from worksheet of origin. Consistent with that structure, public-provenance resources were 99/101 films (98.0%), expert-provenance resources were 137/138 books or music (99.3%), and empirical-study provenance included 130/152 picture books (85.5%). Four of 15 observed cells were empty and three expected frequencies were below five. A Monte Carlo Fisher exact test with 100,000 resamples returned $p < 0.0001$. These statistics document the block-like organization of the archived corpus; they do not show that a provenance category intrinsically favors a medium in library practice.

Table 8. Structural distribution of provenance layers by media type in the archived corpus

Provenance layer (corpus structure)	**Overrepresented media type**	**Frequency**	**Adjusted standardized residual**
Public recommendations	Films	99	19.12
Expert recommendations	Books	76	12.38
Expert recommendations	Music	61	9.14
Empirical studies	Picture books	130	17.50

The provenance-by-problem table was also non-random (chi-square = 118.63, df = 12, p < 0.001; Cramer's V = 0.389), but it is subject to the same source-stream constraint. Public-stream records contained more growth/life-education labels and expert-stream records more anxiety/stress labels within this archive. Because provenance, worksheet origin, media, and some problem content are structurally entangled, these differences are reported as descriptive characteristics of the archived corpus rather than generalized selection laws.

Table 9. Summary of association tests and corpus-structure audits

Relationship tested	Test statistic	df	p-value	Effect size
Problem category by media type	chi-square = 167.37	24	< 0.001	Cramer's V = 0.327
Provenance layer by media type (corpus-structure audit)	chi-square = 668.67	8	< 0.001	Cramer's V = 0.925
Provenance layer by problem category (corpus-structure audit)	chi-square = 118.63	12	< 0.001	Cramer's V = 0.389

Cross-layer recurrence was extremely limited: 390 of 391 resources appeared in only one provenance layer, one appeared in two, and none appeared in all three. Given the worksheet-based construction of the archive, this near-zero recurrence should be read primarily as another property of corpus organization, not as evidence that public, expert, and empirical recommendation ecosystems are inherently non-convergent. The legacy Evidence Consistency Index therefore has negligible dispersion and is not used for ranking or for claims of cross-source corroboration.

4.6 Robustness and Data-Completeness Checks

The main problem-by-media association remained significant after excluding all 108 resources recoded from an originally pending or mixed problem category (N = 283; chi-square = 170.99, df = 24, p < 0.001; Cramer's V = 0.389). Anxiety-stress with books (ASR = 4.76), anxiety-stress with music (ASR = 5.59), growth-life education with films (ASR = 6.85), and self-identity/personal value with picture books (ASR = 4.07) remained above the conservative threshold. The interpersonal/social-adaptation with picture-books pattern did not remain stable (ASR = 0.55) and is therefore downgraded from a core finding.

The known reliability-sample divergences produced the same overall conclusion. Excluding all 18 items for which both coders agreed with each other but differed from the archived analytic label left N = 373 and yielded chi-square = 167.18, df = 24, p < 0.001; Cramer's V = 0.335. In a second post-hoc sensitivity analysis, substituting the coders' consensus category for those 18 items while leaving all other labels unchanged yielded chi-square = 168.25, df = 24, p < 0.001; Cramer's V = 0.328. The four core reviewer-facing configurations remained above |ASR| = 2.58 under both analyses. These checks do not repair unobserved classification error outside the 80-item sample, but they show that the known archived-label divergences do not drive the overall problem-by-media association.

The source-provenance-stratified permutation check also indicated that provenance composition alone did not account for the observed problem-by-media association. Across 50,000 permutations that shuffled problem labels only within each source-provenance layer, 14 permuted chi-square statistics equaled or exceeded the observed value of 167.37, giving a Monte Carlo p-value of 0.00030. This is a conditional robustness check rather than a causal test, but it shows that the observed media-problem structure is stronger than expected from provenance-layer composition alone.

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Year missingness was strongly structured rather than plausibly random. Year-identifiability was associated with source-provenance layer (chi-square = 238.41, df = 2, $p < 0.001$; Cramer's V = 0.781), grouped media type (chi-square = 245.86, df = 4, $p < 0.001$; Cramer's V = 0.793), final problem category (chi-square = 69.87, df = 6, $p < 0.001$; Cramer's V = 0.423), and target group (chi-square = 90.36, df = 5, $p < 0.001$; Cramer's V = 0.481). Accordingly, the study does not use the available years to infer temporal trends. Detailed crosstabs are provided in the supplementary audit sheets.

Table 10. Robustness and data-completeness checks

Check	N / permutations	Statistic	df	p-value	Effect / interpretation
Exclude 108 recoded records	283	chi-square = 170.99	24	< 0.001	Cramer's V = 0.389
Source-provenance-stratified permutation	50,000	Observed chi-square = 167.37	-	0.00030	14/50,000 permuted statistics >= observed
Year-identifiability by provenance layer	391	chi-square = 238.41	2	< 0.001	Cramer's V = 0.781
Year-identifiability by grouped media	391	chi-square = 245.86	4	< 0.001	Cramer's V = 0.793
Year-identifiability by problem category	391	chi-square = 69.87	6	< 0.001	Cramer's V = 0.423
Year-identifiability by target group	391	chi-square = 90.36	5	< 0.001	Cramer's V = 0.481
Exclude 18 consensus-vs-reference divergent items	373	chi-square = 167.18	24	< 0.001	Cramer's V = 0.335
Substitute coder-consensus labels for 18 divergent items	391	chi-square = 168.25	24	< 0.001	Cramer's V = 0.328; post-hoc sensitivity

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5. Discussion

5.1 From Reading Lists to Provenance-Aware Resource Systems

The findings suggest that bibliotherapy-informed wellbeing resources should no longer be understood merely as reading lists or thematic collections. Although reading lists remain useful for public communication and service promotion, they are limited in their ability to support structured retrieval, explainable recommendation, and scenario-based service design. The resources in the dataset were distributed across multiple problem categories, media types, target groups, and source-provenance layers. This indicates that library-based wellbeing resources already have the characteristics of a structured resource system, even if they are often presented in practice as loosely organized lists.

This shift has important implications for smart library services. In traditional reading promotion, the central question is often what resources should be recommended. In smart library wellbeing services, however, the more important questions are: for whom is the resource suitable, what problem context does it address, why is

this media type appropriate, and through what source channel did the recommendation enter the collection? Answering these questions requires libraries to enrich the metadata structure of wellbeing resources.

Provenance-aware organization provides a way to move from resource aggregation to resource explanation. Resource records should include not only conventional bibliographic information, but also target group, problem category, media type, provenance layer, provenance granularity, recommendation context, service scenario, and risk boundary. Such organization can support more transparent and accountable services without implying that provenance alone measures therapeutic evidence.

5.2 Media-Problem Fit as an Organizing Principle

The most defensible media-problem result is the persistence of the overall association across several deliberately conservative checks. The full-sample association was moderate (Cramer's V = 0.327); the overall association remained after excluding all 108 recoded records, after excluding the 18 known consensus-versus-reference divergent items, after substituting the coders' consensus labels for those 18 items, and in the within-provenance permutation analysis. Four positive configurations were stable in the 108-record deletion sensitivity analysis: anxiety-stress with books and music, growth-life education with films, and self-identity/personal value with picture books. These results make the overall media-problem structure more defensible, while the retrospective reliability audit requires caution about individual cell labels - especially picture-book cells - and does not justify causal interpretation.

Media-problem fit does not mean that one medium is universally better for a problem, nor that the observed associations establish therapeutic effectiveness. Instead, it identifies recurrent configurations in the reconstructed recommendation corpus that may be useful for metadata design, exploratory retrieval, and human-reviewed service packaging. The full-sample interpersonal/social-adaptation with picture-books pattern should be treated as less robust because it did not survive the exclusion of recoded records.

This perspective helps explain why multimodal resource organization is necessary. If different media types provide different kinds of support, then library wellbeing services should not be organized solely by document type or shelf category. Instead, resources should be organized around problem scenarios and user needs, allowing libraries to design cross-media resource packages for anxiety, loneliness, identity confusion, growth, and social adaptation.

5.3 Source Provenance and Recommendation Transparency

The provenance analyses now serve a narrower purpose than in the submitted manuscript. The very large provenance-by-media effect (Cramer's V = 0.925) largely restates the organization of the archived workbook, because worksheet origin jointly determines medium and source channel for most records. It should therefore be treated as a corpus-structure audit, not as evidence of substantive source specialization or of differences in evidential strength.

For library services, the value of provenance labeling lies in transparency. A recommendation record can expose whether a resource entered the corpus through public visibility, expert or professional selection, or documented empirical use. Such provenance information can support explanation and audit, but it should be presented alongside source granularity and uncertainty rather than converted into an unsupported quality score.

For library practice, the useful lesson is not that one provenance stream should be preferred over another, but that derived recommendation systems should retain enough source metadata for users and librarians to see where a resource record came from and how confidently that origin is known. The near-zero cross-layer recurrence in this archive cannot establish that recommendation channels are generally parallel or independent; it shows that this particular archived package contains little cross-channel overlap. Provenance labels are therefore transparency metadata, not a quality score.

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5.4 Implications for Smart Library Wellbeing Services and Human-AI Curation

The findings have several implications for the development of smart library wellbeing services. First, libraries should design metadata schemas for wellbeing resources that go beyond conventional bibliographic description. Second, libraries should organize wellbeing resources around problem scenarios rather than media categories alone. Third, libraries should develop explainable recommendation mechanisms that tell users why a resource is recommended, what type of support it may provide, and what limitations it has. Fourth, libraries should maintain clear ethical boundaries, especially when resources address anxiety, depression, trauma, addiction, or other sensitive issues.

These patterns can also be translated into physical and hybrid library service spaces. For instance, anxiety- and stress-oriented packages can be embedded in quiet spaces, stress-relief corners, or exam-season support services by combining self-help books, calming music, and short guidance notes. Growth and life education resources can be organized through film viewing, guided discussion, and reflective reading programs. Picture-book resources related to self-identity and social adaptation can be placed in family reading corners, inclusive reading areas, micro-themed wellbeing spaces, or culturally enriched reading spaces. Such scenario-based organization connects the statistical pattern of media-problem fit with concrete service design.

The structured framework developed in this study also has implications for human-AI collaborative curation and intelligent agents. AI tools and intelligent agents may assist libraries in extracting problem labels, normalizing resource descriptions, identifying similar themes, clustering resources, generating draft recommendation explanations, and assembling cross-media resource packages for different service scenarios. For example, an intelligent agent could suggest an anxiety-support package by combining books, music, and short explanatory texts, or generate a growth-oriented film-and-discussion package for a life education program. However, these agents should operate within a human-reviewed workflow. Librarians and domain experts should verify problem labels, source-provenance labels, provenance granularity, and recommendation explanations before resources are delivered to users.

5.5 Contributions

Theoretically, this study shifts attention from service descriptions and intervention cases to the internal organization of recommended wellbeing resources. Methodologically, it contributes an independent re-annotation and two-level resource-source reorganization of an existing public archive, together with an explicit provenance audit, a seven-category problem schema whose limitations are empirically documented, and a set of association and sensitivity analyses. Practically, it offers a transparent metadata logic for provenance-aware, media-sensitive, and human-reviewed library wellbeing services. These contributions do not depend on claiming a new underlying corpus or on interpreting provenance as therapeutic evidence strength.

6. Limitations and Future Research

This study has several limitations. First, the corpus was derived entirely from the publicly accessible data package archived by X. Wang et al. (2026b); it is an independent re-annotation and reorganization of that material, not an independently collected or exhaustive census of bibliotherapy-informed resources. The package documentation describes a complete archive of 1,532 resource instances, while the worksheets and sample documents available for the present source-level reconstruction yielded 391 unique resources after consolidation. The analytical corpus is therefore a non-probability convenience subset of the archive rather than a probability sample of it, and its descriptive distributions should not be generalized to the complete inventory. The archived package also preserves source information at uneven granularity, and a complete retrieval-window log is not available for every source stream. The present analysis therefore remains bounded by the coverage, release, and organization decisions of the source archive.

Second, year information was incomplete and its missingness was strongly associated with provenance layer, media type, problem category, and target group. The available 151 resource years are therefore not treated as a

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representative temporal sample. This study makes no longitudinal claim about historical evolution or diffusion of particular media or problem categories.

Third, the final first-level problem category is a mutually exclusive analytical simplification imposed on resources that can carry several problem descriptors. The independent 80-item reliability audit produced high inter-coder agreement (90.0%; Cohen's kappa = 0.880, 95% CI 0.801-0.959), but independent application of the current rules reproduced the archived analytic field in only 72.5% and 70.0% of sampled items for the two coders. Eighteen items showed coder consensus that differed from the archived label, with the lowest analytic-field reproduction among picture books. The two boundary rules now stated in Section 3.4.1 were derived from this audit and were not retroactively used to overwrite the frozen primary field. Exclusion and consensus-substitution sensitivities for the 18 known divergences preserved the overall problem-by-media association, as did exclusion of all 108 pending/mixed recoded records; nevertheless, unobserved classification error outside the reliability sample remains possible, and picture-book cell patterns should be interpreted most cautiously. Reliability was quantified only for the problem-category field, not for target group, media type, or provenance layer.

Fourth, provenance layer and media type are strongly confounded by the archived workbook structure. For most records, both were jointly inherited from worksheet of origin. The resulting provenance-by-media association and the near-zero cross-layer recurrence are therefore primarily descriptions of corpus construction, not generalizable properties of bibliotherapy recommendation channels. The provenance categories also do not constitute an evidence-strength hierarchy.

Fifth, this study focused on resource organization rather than user outcomes. It examined how resources were distributed across problem categories, media types, target groups, and source-provenance layers, but did not test whether specific resources improved users' mental health, emotional regulation, or wellbeing outcomes. Future studies could combine resource-structure analysis with user studies, service evaluation, interviews, experiments, or longitudinal usage data.

7. Conclusion

This study independently re-annotated and reorganized the openly shared tabular portion of a publicly archived bibliotherapy-informed wellbeing resource package into 391 unique resources and 447 source-occurrence records, linking target groups, final problem categories, media types, and provenance metadata while retaining source and recoding audit traces. The 391-resource corpus is a non-probability convenience subset of the larger archive and is analyzed as such.

Problem category and media type were associated in the frozen analytic field, and the overall relationship remained after excluding all 108 pending/mixed recoded records, after excluding or consensus-substituting the 18 known reliability-sample divergences, and in a within-provenance permutation check. The most stable positive configurations linked anxiety and stress with books and music, growth and life education with films, and self-identity and personal value with picture books. These are corpus-level structural associations, not evidence of therapeutic superiority or causal media effects.

The revision also changes the interpretation of provenance. The very large provenance-by-media association primarily reflects the worksheet structure of the archived source package and is reported as a corpus-structure audit rather than a substantive source preference. Together with the reliability findings, this places the main contribution in transparent re-annotation, metadata design, and auditable uncertainty. Smart library wellbeing services can use such structures for explainable, human-reviewed recommendation only when source derivation, classification limits, and non-clinical boundaries remain visible.

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Declarations

Availability of data and materials

The underlying recommendation records analyzed in this study derive from the public archive deposited by X. Wang et al. (2026b), Version 1, handle 20.500.12304/13242. The source package describes a complete inventory of 1,532 resource instances; the present study analyzes the openly shared tabular worksheets and sample documents, from which 391 unique resources were obtained after consolidation. The source archive contains the original resource titles, free-text problem descriptions, selection information, and source materials. The supplementary files accompanying the present revision contain derived research products created by the present authors, including the deduplicated resource-source structure, final analytical categories, provenance audit, target-group derivation audit, archive-coverage audit, recoding log, reliability audit (Supplementary Table S6), residual and multiplicity analyses, missingness checks, and sensitivity analyses. Reuse or redistribution of material originating in the source archive remains subject to the terms displayed by that archive; this manuscript does not assert a broader license than the archived record establishes.

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Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Author contributions

Wang Chao contributed to the conceptualization of the study, research design, data organization, coding framework development, statistical analysis, interpretation of results, and manuscript drafting. Xueru Duan contributed to literature review, data verification, coding refinement, interpretation of findings, manuscript revision, and formatting. Both authors read and approved the final manuscript.

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AI usage statement

During manuscript preparation, artificial intelligence tools were used to assist with language polishing, structural refinement, and English academic expression. The authors reviewed, revised, and verified all AI-assisted content and take full responsibility for the accuracy, integrity, and originality of the final manuscript.

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