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Objective–Conclusion Consistency in Abstracts of Orthodontic Randomized Clinical Trials: A Cross-Sectional Study

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ABSTRACT

Background: Randomized clinical trial abstracts strongly influence literature screening and clinical interpretation. Although previous orthodontic meta-research has assessed whether objectives and conclusions are reported, less attention has been given to whether the conclusion actually answers the objective stated in the same abstract.

Objective: To evaluate the consistency between stated objectives and conclusions in a cross-sectional sample of 200 PubMed-indexed randomized orthodontic clinical trial abstracts published from 2023 through 2025, and to characterize the main types of mismatches.

Methods: PubMed/MEDLINE was searched using a core orthodontic randomized-trial strategy supplemented by topic-specific searches. Eligible human randomized orthodontic trial reports with an identifiable abstract objective and conclusion were sampled until 200 unique reports were confirmed. Objective–conclusion consistency was assessed across four prespecified domains: population/clinical context, intervention/comparator, outcome/intended effect, and scope of inference. Abstracts were classified as fully consistent, partially consistent, or inconsistent. Wilson 95% confidence intervals were calculated for prevalence estimates, and consistency across publication years was compared using a chi-square test. All non-full ratings underwent a second audit.

Results: Among 200 abstracts, 176 were fully consistent (88.0%; 95% CI 82.8–91.8), 23 were partially consistent (11.5%; 95% CI 7.8–16.7), and 1 was inconsistent (0.5%; 95% CI 0.1–2.8). Full consistency was observed in 50/58 abstracts from 2023 (86.2%), 57/60 from 2024 (95.0%), and 69/82 from 2025 (84.1%); the difference by publication year was not statistically significant (χ^2=4.11, P=0.128). Among the 24 abstracts that were not fully consistent, the most common problem was broadening the scope or introducing an unstated claim (12/24, 50.0%), followed by omission of a stated objective or outcome (8/24, 33.3%).

Conclusion: Most recent randomized orthodontic trial abstracts showed good internal alignment between their stated objectives and conclusions. Nevertheless, approximately one in eight was not fully consistent, most often because the conclusion broadened the clinical message or omitted part of the stated objective. Explicit objective–conclusion checking during writing, peer review, and editorial assessment may improve the interpretability of orthodontic trial abstracts.

Keywords: Orthodontics, Randomized Controlled Trials, Abstracts, Reporting Quality, Consort, Meta-Research, Research Integrity, Evidence-Based Dentistry

Introduction

Randomized controlled trials (RCTs) provide a central source of evidence for evaluating the effectiveness, safety, efficiency, and patient-centered effects of orthodontic interventions. Their findings inform systematic reviews, guideline development, and everyday clinical decision-making. The usefulness of an RCT, however, depends not only on appropriate design and conduct but also on accurate and coherent reporting.

The abstract has particular importance because it is often the first, and sometimes the only, part of an article read by clinicians and researchers. Abstracts are used to judge eligibility during literature screening and to decide whether a full report is worth retrieving. When full-text access is limited, the abstract may become the principal representation of the trial. Consequently, an abstract that contains internally inconsistent messages may

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alter how the study is interpreted even when the full article is methodologically sound.

Reporting guidelines were developed partly to reduce these problems. CONSORT for Abstracts specifies the minimum information that should be included in journal and conference abstracts of randomized trials [1]. The CONSORT 2025 statement now supersedes CONSORT 2010 and continues to emphasize accurate, transparent, and non-distorted reporting of randomized trials [2,3]. Importantly, reporting completeness and internal consistency are related but distinct constructs. An abstract may contain both an objective and a conclusion yet still fail to ensure that the conclusion directly answers the question that was stated.

Orthodontic meta-research has repeatedly identified deficiencies in randomized-trial reporting. Alharbi and Almuzian evaluated 224 RCT abstracts from four major orthodontic journals and reported incomplete overall adherence to CONSORT for Abstracts, although objectives and conclusions were among the most commonly reported components [4]. Other orthodontic studies have shown improvement in CONSORT reporting over time while demonstrating persisting deficiencies [5-8]. These studies establish that the presence of an objective and a conclusion is common; they do not establish that those two statements are semantically aligned.

Several forms of mismatch are possible. A conclusion may omit one component of a multi-part objective, emphasize an outcome that was not specified in the objective, remove the relevant comparator, or generalize beyond the patient population, follow-up period, or clinical question originally stated. Such discrepancies are conceptually related to selective interpretation and spin, although objective–conclusion inconsistency should not automatically be interpreted as deliberate spin [9,10]. Systematic evidence from healthcare research has also shown that abstracts may be incomplete or inconsistent representations of the underlying article, reinforcing the need for careful abstract interpretation [11].

This issue is particularly relevant in orthodontics because many trials evaluate multiple domains simultaneously, including tooth movement, treatment duration, pain, root resorption, periodontal outcomes, patient experience, stability, and skeletal or soft-tissue effects. A concise concluding sentence can therefore shift the clinical message by selectively emphasizing one outcome or by extending beyond the stated research question.

The primary aim of this cross-sectional meta-research study was to evaluate the consistency between stated objectives and conclusions in a sample of 200 PubMed-indexed randomized orthodontic clinical trial abstracts published from 2023 through 2025. Secondary aims were to characterize the principal types of mismatches and to explore whether the prevalence of full consistency differed across publication years.

Methods

Study Design

A cross-sectional meta-research study was conducted on published abstracts of randomized orthodontic clinical trials. The unit of analysis was the individual journal-article abstract. The study evaluated internal semantic consistency within the abstract; it did not assess whether the conclusion was supported by the full article, protocol, registry entry, or statistical results.

Information Source, Study Period, and Search Date

PubMed/MEDLINE was used as the bibliographic source. Searches were conducted on 20 August 2026. Eligible reports had a PubMed citation/publication year of 2023, 2024, or 2025. Citation year rather than first electronic-publication date was used to avoid excluding articles assigned to a 2023–2025 journal issue after an earlier online-ahead-of-print release.

Search Strategy and Sampling

A sensitive core search combined orthodontic terms with randomized-trial terms and the 2023–2025 publication window. Because orthodontic RCTs may be indexed in general dental, oral-health, surgical, laser, and specialty journals rather than only orthodontic journals, the core search was supplemented with targeted PubMed searches covering clear aligners, fixed appliances and archwires, functional appliances, retention, maxillary expansion, Class II and Class III correction, anchorage and temporary anchorage devices, accelerated tooth movement, pain and adverse effects, oral hygiene during orthodontic treatment, bonding, and treatment monitoring. Screening continued until the prespecified target of 200 unique eligible reports was reached.

Core PubMed strategy:

(("Orthodontics"[MeSH Terms] OR orthodontic[Title/Abstract] OR malocclusion*[Title/Abstract] OR "clear aligner*"[Title/Abstract] OR "fixed appliance*"[Title/Abstract] OR "functional appliance*"[Title/Abstract] OR retainer*[Title/Abstract]) AND ("Randomized Controlled Trial"[Publication Type] OR "Controlled Clinical Trial"[Publication Type] OR randomized[Title/Abstract] OR randomised[Title/Abstract] OR randomly[Title/Abstract]) AND ("2023/01/01"[Date - Publication] : "2025/12/31"[Date - Publication])) NOT (animals[MeSH Terms] NOT humans[MeSH Terms])*

The study was designed as a fixed-size cross-sectional sample rather than an exhaustive systematic review. Accordingly, no claim is made that the 200 reports represent every PubMed-indexed orthodontic RCT published during the three-year interval. The target of 200 was selected to provide a feasible but reasonably precise prevalence estimate; for a prevalence near 80–90%, a sample of 200 yields an approximate 95% confidence-interval half-width of about 4.5–5.5 percentage points.

Eligibility Criteria

Reports were included when all of the following criteria were met:

- Human randomized or randomised clinical trial with prospective random allocation of participants or appropriate within-person units.
- Orthodontics was the principal clinical context, including an orthodontic intervention, appliance, treatment strategy, retention method, anchorage method, adjunctive procedure, treatment-related adverse effect, or patient-centered orthodontic outcome.
- PubMed citation/publication year was 2023, 2024, or 2025.
- A full journal report with an English-language abstract was

available in PubMed.
- The abstract contained an identifiable objective, aim, purpose, or research question and an identifiable concluding statement.

Reports were excluded if they were protocols, non-randomized or quasi-randomized studies, observational or retrospective studies, laboratory/in-vitro or animal studies, systematic reviews, conference abstracts without a full journal report, retracted reports, or abstracts in which the objective or conclusion could not be identified. Duplicate records were removed. Separate article-level reports from the same underlying trial could be retained when they addressed a distinct objective because the abstract, rather than the trial registration, was the unit of analysis.

Data Extraction and Consistency Assessment

For each included record, the PubMed identifier (PMID), publication year, article descriptor, abstract objective, and abstract conclusion were reviewed. Consistency was judged using a prespecified four-domain framework. Semantic equivalence rather than identical wording was required.

Domain	Assessment question	Example of material mismatch
Population / clinical context	Does the conclusion refer to the same population or orthodontic context?	Objective concerns adolescents; conclusion generalizes to all orthodontic patients.
Intervention / comparator	Does the conclusion preserve the intervention and comparison specified in the objective?	Objective compares A with B; conclusion omits or changes the comparison.
Outcome / intended effect	Does the conclusion answer the outcome, effect, or relationship stated in the objective?	Objective concerns pain; conclusion emphasizes treatment duration not stated in the objective.
Scope of inference	Is the breadth and strength of the conclusion proportionate to the stated objective?	Objective evaluates a short-term outcome; conclusion claims general or long-term clinical superiority.

The overall classification was defined as follows:
- Fully consistent: all applicable domains were aligned; the conclusion directly answered the principal stated objective without a material change in scope.
- Partially consistent: the principal objective was addressed, but a meaningful component was omitted, narrowed, or mildly broadened while the central research question remained recognizable.
- Inconsistent: the conclusion failed to answer the principal objective or materially changed the population, comparison, outcome, direction, or scope of inference.

When full consistency was absent, the primary discrepancy was coded as: broadened scope/introduction of an unstated claim; omission of a stated objective or outcome; omission of the comparator/comparative finding; narrowed/selective conclusion; or other.

Screening, Coding, and Audit

Automated language-model assistance was used to support literature screening and objective–conclusion coding under the prespecified eligibility criteria and codebook. Coding was restricted to information available in the PubMed record and abstract and did not infer unstated author intent. All abstracts initially classified as partially consistent or inconsistent underwent a second audit focused on the objective, conclusion, and reason for discordance. PMID-level records and coding decisions were retained in a supplementary dataset to permit independent verification.

The assessment was not independently duplicated by two human reviewers. Consequently, an inter-rater kappa statistic was not calculated.

Statistical Analysis

Frequencies and percentages were calculated for the three consistency categories. Wilson 95% confidence intervals were used for the category proportions. Full consistency was also summarized by publication year. For an exploratory comparison across 2023, 2024, and 2025, classifications were dichotomized as fully consistent versus not fully consistent (partial or inconsistent) and compared using Pearson's chi-square test. Statistical significance was set at a two-sided $P<0.05$. Analyses were performed in Python using pandas, SciPy, and stats models.

Ethical Considerations

The study analyzed publicly available bibliographic records and published abstracts and did not involve patients, identifiable private information, or individual-level clinical data. Formal patient consent was therefore not applicable.

Results

Sample Characteristics

The final cross-sectional sample comprised 200 unique PubMed-indexed randomized orthodontic clinical trial reports. Fifty-eight reports (29.0%) had a 2023 citation year, 60 (30.0%) had a 2024 citation year, and 82 (41.0%) had a 2025 citation year.

Year	Total n	Full n (%)	Partial n (%)	Inconsistent n (%)	95% CI for full consistency
2023	58	50 (86.2)	8 (13.8)	0 (0.0)	75.1–92.8
2024	60	57 (95.0)	3 (5.0)	0 (0.0)	86.3–98.3
2025	82	69 (84.1)	12 (14.6)	1 (1.2)	74.7–90.5

Overall Objective–Conclusion Consistency

Full consistency was identified in 176 of 200 abstracts (88.0%; 95% CI 82.8–91.8). Twenty-three abstracts were partially consistent (11.5%; 95% CI 7.8–16.7), and one abstract was materially inconsistent (0.5%; 95% CI 0.1–2.8). Thus, 24 abstracts (12.0%) showed at least one meaningful objective–conclusion discrepancy.

Classification	n	%	Wilson 95% CI
Full	176	88.0	82.8–91.8
Partial	23	11.5	7.8–16.7
Inconsistent	1	0.5	0.1–2.8

Types of mismatches

Among the 24 abstracts that were not fully consistent, the most common discrepancy was broadening the scope or introducing an unstated claim in the conclusion (12/24, 50.0%). Omission of a stated objective or outcome accounted for 8/24 cases (33.3%). Two abstracts (8.3%) had a narrowed or selective conclusion, and two (8.3%) omitted the stated comparator or comparative finding.

Primary discrepancy	n	% of non-full (n=24)	% of all abstracts (n=200)
Broadened scope / introduced an unstated claim	12	50.0	6.0
Stated objective/outcome omitted	8	33.3	4.0
Narrowed/selective conclusion	2	8.3	1.0
Comparator/comparative finding omitted	2	8.3	1.0

The single abstract classified as inconsistent stated an objective centered on condylar-position changes assessed with three-dimensional temporomandibular-joint analysis, whereas its conclusion extended to broad claims of superiority across skeletal, dental, soft-tissue, compliance, and acceptance outcomes. This was considered a material change in the scope of inference rather than a minor omission.

Consistency by Publication Year

Full consistency was 86.2% in 2023, 95.0% in 2024, and 84.1% in 2025. When full consistency was compared with partial/inconsistent classification across the three publication years, the difference did not reach statistical significance (χ^2=4.11, df=2, P=0.128). The study therefore did not identify evidence of a monotonic improvement or deterioration across this short three-year period.

Discussion

In this cross-sectional sample of 200 recent randomized orthodontic clinical trial abstracts, 88.0% showed full alignment between the objective stated in the abstract and the conclusion presented by the authors. However, 12.0% were not fully consistent. The principal problem was not a completely unrelated conclusion; rather, it was usually a subtle expansion of the clinical message or omission of part of a multi-component objective. Only one abstract was judged materially inconsistent.

These findings add a different dimension to previous orthodontic reporting studies. Earlier work has generally evaluated whether CONSORT-recommended abstract items were present. Alharbi and Almuzian reported that objectives and conclusions were among the most frequently included items in orthodontic RCT abstracts, despite incomplete overall reporting [4]. Similar findings have been reported for orthodontic congress abstracts and full RCT reports [5-8]. The present results suggest that high reporting frequency does not eliminate a smaller but meaningful problem of semantic mismatch between what the abstract says it set out to investigate and what it ultimately claims.

The most frequent discrepancy—broadening of scope or introduction of an unstated claim—has particular clinical relevance. Examples included conclusions that moved from a narrowly defined outcome to a recommendation about overall clinical superiority, practice adoption, safety, long-term behavior, or treatment success. Such statements may be reasonable when supported by the full trial, but within the abstract they can create a mismatch because the reader was not told that these broader questions formed part of the stated objective. In a fast-reading clinical environment, the final sentence may therefore carry a stronger message than the research question that preceded it.

The second most common problem was omission of a stated objective or outcome. Multi-outcome orthodontic trials are especially vulnerable because abstract word limits encourage compression. When an objective explicitly includes two or more domains—for example, alignment plus root resorption, or pain plus periodontal outcomes—but the conclusion reports only one, the abstract can appear selectively focused even when there is no intent to mislead. A more concise objective or a conclusion that explicitly acknowledges the principal findings across all stated domains would improve internal coherence.

These discrepancies should not automatically be labeled spin. Spin generally refers to reporting practices that distort interpretation, frequently in relation to statistically non-significant primary outcomes [9,10]. Objective–conclusion inconsistency is broader and can occur without any statistical distortion. Nevertheless, both phenomena share a concern: the concluding message may exceed, narrow, or redirect the question that readers were told the trial addressed.

The results are also relevant to CONSORT. CONSORT for Abstracts has long emphasized complete reporting of essential trial information, and CONSORT 2025 now reinforces accurate and transparent representation of randomized trials [1-3]. The studies in this sample should not be retrospectively judged for compliance with a guideline published in April 2025. Rather, the updated guidance provides a contemporary rationale for paying closer attention to the coherence of the abstract as a whole. A checklist can confirm that an objective and a conclusion are present, but it does not necessarily determine whether they correspond.

No statistically significant difference in full consistency was detected across publication years. The apparently higher

proportion in 2024 should therefore be interpreted cautiously, especially because the study was not powered for year-to-year comparisons and used a fixed-size sample rather than an exhaustive census. The absence of a temporal trend over only three years does not rule out longer-term improvement.

The practical implication is straightforward. During manuscript preparation, authors can perform a final 'objective–conclusion audit': identify the population, comparison, outcome, and scope in the stated objective and verify that the concluding sentence addresses those same elements without adding a broader claim. Peer reviewers and editors could incorporate a similar question into abstract assessment: 'Does the conclusion directly and proportionately answer the objective stated in this abstract?' This additional check would complement rather than replace CONSORT-based completeness assessment.

This study has several limitations. First, the 200 reports represent a targeted fixed-size PubMed sample, not every orthodontic RCT published worldwide from 2023 through 2025; generalizability should therefore be limited to similar PubMed-indexed trial reports. Second, the analysis evaluated internal abstract consistency only. It did not compare abstract objectives or conclusions with trial protocols, registrations, full-text outcomes, or statistical results, so an internally consistent abstract could still misrepresent the underlying study. Third, determining semantic consistency involves judgement, particularly for multi-component objectives and concise conclusions. The prespecified four-domain framework and second audit of non-full ratings improved consistency of the process but cannot eliminate interpretive subjectivity.

A further limitation is that the assessment was not independently duplicated by two human reviewers; therefore, no inter-rater reliability statistic is reported. Future work should validate the framework using two or more blinded reviewers and report inter-rater agreement. The article descriptors in the supplementary working dataset are normalized screening labels; the PMID is the authoritative identifier and should be used to export exact bibliographic citations before public deposition of the final dataset.

Despite these limitations, the study provides a transparent, reproducible framework and an article-level audit trail. The finding that approximately one in eight abstracts was not fully aligned suggests that objective–conclusion consistency is a measurable reporting feature that deserves attention alongside conventional completeness checklists.

Conclusion

In a cross-sectional sample of 200 PubMed-indexed randomized orthodontic clinical trial abstracts published in 2023–2025, 88.0% showed full consistency between the stated objective and conclusion, while 12.0% showed partial or material inconsistency. Broadening the scope of the conclusion or introducing an unstated claim was the most common problem, followed by omission of a stated objective or outcome. Explicitly checking that the abstract conclusion directly and proportionately answers the stated objective may improve the clarity and reliability of orthodontic trial reporting.

Declarations

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Ethics approval and consent to participate: Not applicable. This study analyzed publicly available bibliographic records and published abstracts and did not involve patient-level data.

Consent for publication: Not applicable.

Data availability: The PMID-level 200-record scoring dataset accompanies this manuscript as Supplementary Dataset 1. PubMed identifiers provide the authoritative route to each source record.

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Competing interests: The authors declare no conflicts of interest.

Author contributions: M.A. conceived the research question and is responsible for study design, final verification, interpretation, manuscript approval, and accountability for the work.

Supplementary Appendix a. Non-Full Consistency Ratings (n=24)

PMID is the authoritative article identifier. The article descriptors below are normalized screening labels rather than a substitute for an exported PubMed citation. Exact citation titles should be refreshed from PubMed before journal submission or public repository deposition.

PMID	Year	Consistency	Primary issue	Reason for rating
36066265	2023	Partial	Broadened scope	The comparative efficacy/efficiency objective is answered, but the conclusion adds a clinician/family preference recommendation beyond the stated research objective.
36919990	2023	Partial	Broadened scope	The conclusion answers rate and anchorage loss but additionally recommends external anchorage reinforcement, which extends beyond the comparative objective.
36981539	2023	Partial	Broadened scope	Experience objective addressed, but conclusion adds a practice recommendation that teleorthodontics should not become systematic.

37103919	2023	Partial	Narrowed conclusion	The broad oral-hygiene effectiveness objective was assessed with plaque and gingival indices, but the conclusion emphasizes plaque reduction while gingival index did not improve.
37250004	2023	Partial	Broadened scope	Primary tooth-movement objective addressed, but conclusion additionally characterizes PRP as safe/minimally invasive and broadly expedites treatment.
37266982	2023	Partial	Selective/narrowed conclusion	Conclusion emphasizes SME and diagnostic timing, while the stated objectives compared SME, extraction, and no intervention and included eruption/orthodontic-intervention outcomes.
37503575	2023	Partial	Omitted stated outcome	The objective included plaque and gingival indices in addition to halitosis; the conclusion addresses the halitosis treatment implication but omits the oral-hygiene outcomes.
37776695	2023	Partial	Broadened scope	Primary comparative outcomes are answered; conclusion additionally recommends choosing on cost/clinician preference, which was not a stated objective.
37930325	2024	Partial	Omitted stated objective	Skeletal/dental comparison is addressed, but the stated aim to detect factors influencing treatment success/failure is not represented in the conclusion.
39340567	2024	Partial	Omitted stated outcome	The conclusion addresses accuracy, bonding failures and patient preference, but does not report the stated bracket-repositioning objective and only indirectly addresses clinician experience.
39743844	2024	Partial	Introduced unstated outcome / Broadened scope	Objective focused on timing of extraction and rate of space closure; conclusion also emphasized anchorage, rotation/tipping and made a broader clinical recommendation.
39244736	2025	Partial	Omitted stated outcome	The objective included transverse dentoalveolar changes as well as molar distorotation; the conclusion focuses on distorotation and does not summarize the transverse outcomes.
39760890	2025	Partial	Omitted stated outcome	Objective included arch dimensions, dentoskeletal changes, and rate of overbite correction; conclusion did not explicitly address the overbite-correction rate.
40249460	2025	Partial	Omitted stated/ featured outcome	The abstract evaluates tooth movement, gingival hypertrophy and pain, while the concluding statement summarizes acceleration and gingival hypertrophy but does not address pain.
40335201	2025	Partial	Omitted stated objective	Conclusion addresses force/EARR aim but does not address the stated comparison of manual versus AI-aided EARR quantification.
40462033	2025	Partial	Broadened scope	Plaque outcome is answered, but conclusion extends to a general claim that education/oral hygiene are more important than disclosing agents.
40464026	2025	Inconsistent	Broadened scope / introduced unstated outcomes	Abstract objective focused on condylar-position changes on CBCT; conclusion claimed superior skeletal, dental, soft-tissue, compliance, and acceptance outcomes, materially extending beyond the stated objective.
40796394	2025	Partial	Omitted comparison	The conclusion states both protocols were effective but does not convey the comparative finding between palatal and buccal protraction.
41159147	2025	Partial	Omitted comparison	The conclusion states that both protocols alter soft tissues successfully but does not summarize the stated contrast between MSE-facemask and hybrid-Hyrax protocols.
41277148	2025	Partial	Introduced unstated outcome	Alignment objective is answered, but conclusion adds discomfort and root-resorption claims not stated in the objective.

41290275	2025	Partial	Broadened scope	The objective specifically compared S. mutans colonization, whereas the conclusion generalizes the findings to overall oral-hygiene effectiveness.
41309849	2025	Partial	Broadened scope	The oral-hygiene objective is addressed, but the conclusion extends to supporting overall orthodontic treatment success.
41372110	2025	Partial	Omitted stated outcome	Primary wear-time objective is answered, but the stated secondary objective on transverse dimensions/overjet/ overbite is not represented in the conclusion.
41382113	2025	Partial	Broadened scope	The conclusion directly answers oral hygiene and OHL, but extends a 3-month trial to scalable integration and long-term behavioural change.

Supplementary Appendix b. Reproducibility and Verification Checklist

- Re-run the final PubMed search and archive the complete export used for the submitted version.
- Use the 200 PMIDs in Supplementary Dataset 1 to verify exact titles, journal citations, publication years, and retraction status immediately before submission.
- Have at least one independent human reviewer verified all 200 objective–conclusion ratings; ideally use two blinded human reviewers and report agreement.
- Resolve any classification changes before freezing the analysis dataset.
- Confirm the author's funding and competing-interest declarations.
- Retain the coding manual, final dataset, statistical script/ output, and date-stamped search documentation in a research repository where appropriate.

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