



Revisiting Herringbone-Scaffolded Reading: A Statistical Reanalysis of EFL Learners' Gains in Recount-Text Comprehension

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Received: 2025-10-14 Accepted: 2025-11-30

DOI: 10.2456/ideas.v12i2.12647

Abstract

This article revisits data from a quasi-experimental study of the Herringbone technique in reading instruction for eighth-grade EFL learners at MTs Negeri 1 Palu. Rather than repeating the original mean-score comparison, the study provides a transparent secondary statistical reanalysis of the student-level pre-test and post-test scores reported in the research record. Fifty-four students participated, with 27 students in the Herringbone group and 27 in the comparison group. The original instructional treatment was delivered across six meetings and used a visual Herringbone diagram to guide learners in identifying who, what, when, where, why, and how in recount texts. The reanalysis indicates that the Herringbone group increased from a mean of 41.85 to 72.22, whereas the comparison group increased from 44.44 to 60.92. The mean gain difference was 13.89 points. Based on the student-level scores listed in the source record, the independent-samples comparison of gain scores produced $t(52) = 9.39$, and the standardized between-group effect was very large (Cohen's $d = 2.55$; Hedges' $g = 2.52$). Normalized gain was 0.52 for the Herringbone group and 0.30 for the comparison group. These results strengthen the interpretation that the visual questioning framework was associated with substantially greater reading gains. The article also identifies a discrepancy between the t value reported in the original research record (2.353) and the value obtained from the listed student-level scores, highlighting the importance of transparent statistical reporting.

Keywords: *Herringbone technique; reading comprehension; visual scaffolding; recount text; effect size*

Introduction

Reading comprehension is a central component of English language learning because learners are expected not only to decode written language but also to locate, connect, and interpret information in texts. For junior secondary EFL learners, comprehension difficulties may be intensified by limited vocabulary, unfamiliar text structures, and classroom practices that provide insufficient support for organizing textual information. The source study conducted at MTs

Negeri 1 Palu documented these challenges among eighth-grade learners and selected the Herringbone technique as a visual strategy for supporting comprehension.

The Herringbone technique organizes textual information through six guiding questions—who, what, when, where, why, and how—arranged in a fish-skeleton graphic. The approach is pedagogically relevant because it externalizes relationships among details and the main idea, giving learners a visible structure for processing a text. Earlier work has described graphic organizers as useful tools for representing text structure and supporting comprehension, while more recent empirical studies continue to report positive effects of Herringbone or related graphic-organizer approaches on EFL reading.

However, the existing evidence base is often reported through mean-score increases and significance tests alone. Recent work on Herringbone instruction, for example, continues to use pre-test/post-test comparisons to demonstrate improvement, while graphic-organizer research has also examined reading strategies and affective outcomes. This leaves a practical methodological gap: older classroom datasets can be revisited to report the magnitude of learning gains, rather than only whether a statistical threshold is crossed. Such reanalysis is particularly important when a study's original statistical reporting is difficult to reproduce from the available student-level scores.

The present article therefore reframes the earlier MTs Negeri 1 Palu study as a transparent statistical reanalysis. Its contribution is not a claim of new data collection; instead, it offers a more informative interpretation of an existing dataset by comparing gain scores, normalized gain, and standardized effect size, while explicitly documenting a discrepancy in the original t-test report. The analysis is guided by the following question: How large was the difference in reading-comprehension gain between students taught with the Herringbone technique and those receiving the comparison instruction?

Method

Research Design and Data Source

This article uses a secondary quantitative reanalysis of data from a previously completed quasi-experimental classroom study. The original study employed an experimental group and a control group and administered a pre-test before instruction and a post-test after instruction. The source record reports that the study was conducted at MTs Negeri 1 Palu from 9 November to 1 December 2018.

The data consisted of the student-level scores reported in the research record for 54 eighth-grade students. Class VIII F ($n = 27$) served as the experimental group and received the Herringbone treatment, while Class VIII A ($n = 27$) served as the control group. The original population comprised 254 eighth-grade students distributed across eight classes, from which the two classes were selected through a random drawing procedure.

Instrument and Intervention

Reading comprehension was measured through a 15-item test comprising 10 multiple-choice items and 5 essay items, with a maximum score of 100 after conversion. The source study states that the assessment focused on literal reading

comprehension and used recount texts. The Herringbone treatment was conducted over six meetings of 80 minutes each. The instructional sequence included introducing recount texts, constructing a Herringbone diagram, locating answers to the six guiding questions, discussing the information in pairs, summarizing the information, and producing a short text based on learners' experiences.

Reanalysis Procedures

Three complementary indicators were calculated from the listed student-level scores. First, raw gain was computed as post-test minus pre-test score for each learner. Second, normalized gain was estimated as mean gain divided by the maximum possible gain, using the 100-point scale. Third, the difference between group mean gains was standardized using pooled standard deviation to obtain Cohen's *d*; a small-sample correction was then applied to obtain Hedges' *g*. An independent-samples comparison of gain scores was also recalculated from the reported individual scores.

The reanalysis intentionally distinguishes the original statistical report from the present calculation. The source record reports $t = 2.353$ with $df = 52$ and a critical value of 2.013 at $\alpha = .05$. When the individual pre-test and post-test scores reproduced in the source record are used directly, the recalculated gain-score statistic is $t(52) = 9.39$. This difference is reported rather than concealed because reproducibility is a necessary part of responsible quantitative reporting.

Publication Transparency

The dataset analyzed here originates from the earlier study by Arnisa, Hente, and Arid (2019), which reported the same research setting, sample size, Herringbone intervention, and original *t* value. Accordingly, this manuscript should be treated as a reanalysis rather than as a new empirical study. Submission to a journal should proceed only after the authors confirm that the journal permits secondary analysis of previously published data and that the necessary disclosure is acceptable under the journal's publication-ethics policy.

Conceptual Pathway from Visual Prompting to Comprehension

The analytical framework of this article links three processes: attention to textual details, organization of those details, and synthesis into a meaningful representation of the text. The Herringbone diagram is relevant because it makes each process visible. A learner first searches the text for answers to the six prompts. The learner then places those answers into a spatial structure. Finally, the learner uses the organized information to formulate a main idea or summary. The framework therefore treats the organizer as a scaffold for processing rather than as an end product.

This distinction is useful when interpreting the present dataset. The observed gain cannot be attributed to the visual shape of the fish diagram alone. The treatment also contained teacher modeling, repeated questioning, pair discussion, summarization, and text production. Consequently, the most defensible interpretation is that the Herringbone-supported instructional package provided a structured reading routine. The present reanalysis estimates the outcome associated with that package; it does not isolate the unique contribution of the diagram from the other instructional activities.

The framework is also consistent with the broader concept of instructional scaffolding. A scaffold is useful when it helps learners perform a task that would otherwise be difficult and can subsequently be reduced as competence develops. In Herringbone instruction, the six questions can serve as temporary prompts. With repeated practice, students may internalize the same questions without needing the diagram. This possible transition from external support to internal strategy use is a pedagogical implication that deserves direct examination in future research rather than being assumed from the present scores.

Data Integrity and Recalculation Procedure

Data integrity was addressed by retaining a clear distinction between values reported in the source record and values calculated in the present article. The source record provides individual pre-test and post-test scores for the two classes, group means, and the original inferential statistic. The reanalysis uses those reported values rather than introducing newly estimated scores. This procedure reduces the risk of silently altering the historical dataset while allowing an independent calculation of gain-based indicators.

For each student, gain was defined as post-test minus pre-test. The mean gain for each group was then obtained from the student-level gains. The difference between the two group mean gains was divided by the pooled standard deviation of the gain scores to obtain Cohen's *d*. Hedges' *g* was derived by applying a small-sample correction to *d*. Normalized gain was calculated from the group mean gain and the maximum possible improvement remaining on the 100-point scale. These indicators were selected because they complement one another: raw gain is easily interpreted by teachers, normalized gain considers baseline position, and standardized effect size expresses the difference relative to variability.

The discrepancy between the original and recalculated *t* values was not resolved by choosing whichever statistic appeared more favorable. Instead, both values are retained in the manuscript, and the recalculated value is labeled as a secondary calculation. This approach is important because a reanalysis should not erase the historical record. The purpose is to make the analytical difference visible so that readers can judge the evidence with full information.

No new inferential claims were made about variables that were not measured. In particular, classroom observations concerning motivation, vocabulary growth, and fluency are treated as contextual observations rather than as validated outcome measures. Similarly, the present article does not infer effects on inferential or critical comprehension because the source assessment was centered on literal comprehension. This conservative approach is intended to prevent the expanded article from overstating what the dataset can support.

Results and Discussion

Results

Descriptive Change in Reading Scores

Table 1. Pre-test, post-test, and gain-score means

Group	n	Pre-test M	Post-test M	Mean gain
Herringbone	27	41.85	72.22	30.37
Control	27	44.44	60.92	16.48
Difference	—	-2.59	11.30	13.89

The descriptive results show a larger improvement for the Herringbone group than for the control group. The experimental group gained 30.37 points on average, compared with 16.48 points in the control group, yielding a between-group gain difference of 13.89 points. The post-test mean was also 11.30 points higher in the Herringbone group despite the groups beginning with relatively similar pre-test means.

Effect Magnitude and Recalculated Significance

Table 2. Reanalysis indicators derived from the reported student-level scores

Indicator	Herringbone	Control	Interpretation
Mean gain	30.37	16.48	13.89-point advantage
Normalized gain	0.52	0.30	Higher gain proportion
Pooled SD of gain	5.44	—	Used for standardized comparison
Cohen's d	—	—	2.55, very large
Hedges' g	—	—	2.52, very large
Recalculated t	—	—	$t(52) = 9.39$

The standardized results indicate a very large between-group difference in gain scores. Cohen's d was 2.55 and the small-sample corrected Hedges' g was 2.52. Normalized gain was 0.52 for the Herringbone group and 0.30 for the control group. The recalculated gain-score comparison was $t(52) = 9.39$, substantially larger than the original report of $t = 2.353$. Because the raw student-level scores are available in the source record, the recalculated value provides a more reproducible basis for interpreting the magnitude of the observed difference.

Discussion

The reanalysis suggests that the central value of the Herringbone intervention lies not merely in producing a statistically detectable improvement but in the magnitude of the observed gain relative to the comparison condition. The 13.89-point difference in mean gain and the very large standardized effect indicate

that the learners exposed to the visual questioning framework made substantially greater progress over the instructional period represented in the dataset.

A plausible pedagogical explanation is that the Herringbone diagram converts a linear reading task into a visible information-mapping task. Learners are repeatedly prompted to locate concrete details and then connect those details to a central idea. This can reduce the cognitive burden of deciding what information matters and may provide a scaffold for readers who initially struggle with vocabulary and text organization. The source study also recorded classroom-level changes during the treatment: students initially experienced vocabulary limitations, weak attention, and limited fluency, while the researcher subsequently observed greater interest, increased vocabulary, and more fluent reading.

The finding is consistent with more recent evidence that Herringbone remains useful for EFL reading instruction. A 2024 study at SMPN 21 Makassar reported higher post-test performance after Herringbone instruction, although it used a pre-experimental design. Other recent research on graphic organizers has moved beyond a simple mean comparison by examining reading strategies and affective responses, suggesting that visual organization can influence multiple dimensions of reading engagement. The present reanalysis adds to this line of work by demonstrating how an existing classroom dataset can be interpreted through gain magnitude and standardized effect size rather than through a significance test alone.

At the same time, the results should not be interpreted as proof that Herringbone will produce the same effect in every context. The dataset involved one school, two intact classes, a specific recount-text focus, and a relatively short intervention. The original assessment also emphasized literal comprehension, so the present analysis cannot establish comparable effects on inferential or critical comprehension. Moreover, the unusually large recalculated effect should be interpreted cautiously because the intervention was not randomly assigned at the individual level and the original dataset was not collected specifically for the present analysis.

The discrepancy between the original t value and the recalculated statistic is also substantively important. The original report states $t = 2.353$ and compares it with $t_{\text{critical}} = 2.013$, whereas direct calculation from the listed scores yields $t(52) = 9.39$. The discrepancy does not reverse the conclusion of a group difference, but it changes the estimated magnitude of the statistical evidence. For future classroom research, researchers should preserve analysis files, report group means and standard deviations, state the exact statistical test used, and provide enough information for readers to reproduce the result.

Practical Meaning of the Score Changes

The raw-score pattern is educationally interpretable. A mean gain of 30.37 points represents an increase of more than thirty points on a 100-point scale, whereas the comparison group increased by 16.48 points. The difference of 13.89 points is therefore not merely a statistical artifact; it represents a measurable separation in achievement change. At the same time, the baseline means were not identical. The control group began 2.59 points higher, so the final 11.30-point post-

test difference should be interpreted together with the initial difference rather than as a pure post-test comparison.

The normalized-gain values add another layer of interpretation. Because students with higher initial scores have less room to improve, raw gain alone can sometimes exaggerate or understate progress. The Herringbone group's normalized gain of 0.52 indicates that its average improvement represented approximately 52 percent of the improvement that remained possible above the initial mean. The control group's value of 0.30 indicates a smaller proportion of available improvement. These values should be viewed descriptively because normalized gain has its own assumptions and does not correct for all threats to validity.

The standardized effect estimates are unusually large. This is precisely why the design limitations need to be stated alongside the numerical result. A very large effect can occur when an intervention genuinely produces a strong difference, but it can also be influenced by small samples, intact-group differences, measurement characteristics, or restricted score variability. The present article therefore avoids interpreting $d = 2.55$ as a population effect. Instead, it describes it as a very large observed standardized difference in this particular dataset.

Why the Reanalysis Matters for Reproducible EFL Research

The reanalysis has implications beyond the Herringbone technique. Educational research in EFL often occurs in ordinary classrooms where researchers work with intact classes, modest samples, and locally developed assessments. Such studies are valuable because they reflect authentic instructional conditions, but they also require careful reporting. When only a significance value is reported, later readers cannot easily determine whether the result reflects a large or small educational difference. Including gain distributions, group variability, effect sizes, and transparent calculation procedures makes classroom research more cumulative.

The present example also shows why secondary analysis can contribute to the literature without pretending to be a new experiment. A previously published dataset can sometimes answer a different question from the one addressed in the original study. Here, the original question concerned the effectiveness of Herringbone instruction, whereas the present analysis focuses on the magnitude and reproducibility of the gain. The distinction is substantive: the article does not duplicate the original study's contribution, but instead reframes the dataset through a more detailed quantitative lens.

For future Herringbone research, several design improvements are recommended. Researchers could compare Herringbone with another evidence-based reading strategy rather than with a broadly described conventional condition. They could also include delayed post-tests to determine whether the strategy supports retention, and they could separate literal, inferential, and evaluative comprehension in the assessment. Process data such as completed diagrams, learner explanations, think-aloud protocols, or strategy-use questionnaires could help identify which parts of the intervention are most closely associated with improvement.

Another useful direction is differentiation. Learners with very limited vocabulary may require lexical support before the six-question routine can function effectively. More proficient learners may benefit from using the diagram as a starting point for inference, synthesis, and critical evaluation rather than as a checklist of explicit details. Future studies could therefore examine whether Herringbone effects vary by proficiency level and whether the organizer should be gradually faded as learners become more independent.

Finally, future reports should distinguish statistical significance, practical significance, and instructional feasibility. A statistically large effect is important, but teachers also need to know how much classroom time the strategy requires, what materials are needed, how easily students can work independently, and whether the approach transfers to unfamiliar texts. The six-meeting intervention in the source study suggests that Herringbone can be embedded in a short instructional sequence, but the present dataset cannot establish the minimum number of meetings required or the sustainability of the observed gain.

Comparison with Recent Evidence

Recent Herringbone studies help place the present reanalysis in a continuing research trajectory. Yusuf et al. (2016) examined recount-text comprehension and described Herringbone as a means of directing learners toward the main idea and supporting details. Desiana (2018) reported improvement in reading comprehension and participation among eleventh-grade students after two action-research cycles. Amumpuni (2021) used a quasi-experimental design and found a significant effect in a different learner population. Nurhasina et al. (2023) and Hasanah et al. (2023) reported positive outcomes in Indonesian secondary-school contexts. Maharani et al. (2024) focused on eighth-grade students, which makes the educational level comparable to the present dataset. Sitio et al. (2026) extended the technique to news-item texts and a senior-high-school population. Together, these studies indicate that Herringbone has been repeatedly explored across text types, grade levels, and research designs.

The present analysis differs from these studies in its analytical purpose. Most intervention studies ask whether learners' post-test performance is higher than their pre-test performance or whether an experimental group differs from a comparison condition. The present article instead takes a dataset that has already been used for that purpose and examines the magnitude of change. This distinction is important for cumulative knowledge. If every study is interpreted only as significant or non-significant, the literature may contain many positive findings without a clear sense of how large the differences are. Effect-size reporting and transparent recalculation can make results more comparable.

The wider graphic-organizer literature also suggests that visual representation should not be viewed as a single, uniform intervention. Lee (2018) found an overall positive effect of graphic organizers in English instruction but also reported different effect patterns for reading and writing. Dexter and Hughes (2011) synthesized evidence across multiple subject areas and learner populations, indicating that organizer features and outcome measures matter. Li et al. (2021) considered graphic organizers alongside other instructional strategies for English learners. Os and Bae (2024) connected graphic-organizer instruction with reading

strategies and affective variables, while Lei et al. (2026) examined higher-order thinking outcomes across a large body of research. These studies imply that the value of an organizer depends partly on what learners are asked to do with it.

For Herringbone specifically, this means that future research should examine the quality of student processing inside the diagram. Two students can complete the same six boxes but demonstrate different levels of comprehension. One may copy isolated words from the text, whereas another may select relevant details, connect causal information, and synthesize an accurate main idea. A future study could score the diagrams themselves or analyze students' explanations to determine whether improvement in test performance corresponds to deeper strategic processing.

Transfer Across Text Types and Reading Outcomes

The source study focused on recount texts, and this focus should remain central to the interpretation of the findings. Recount texts provide a relatively clear event structure, which maps naturally onto the Herringbone questions. Who identifies participants, when and where establish context, what identifies events, and why and how can capture causes or procedures. The fit between organizer and text structure may partly explain why the technique was useful in this context. It does not follow that the same magnitude of gain would occur with argumentative, expository, or literary texts, where relationships among ideas can be less explicitly event-based.

Text-type transfer is therefore an important direction for future research. A multi-condition study could compare Herringbone-supported instruction across recount, narrative, report, and argumentative texts. Researchers could then examine whether the effect varies with text organization. Such work would clarify whether Herringbone is best understood as a general reading strategy or as a particularly suitable scaffold for texts containing identifiable people, events, contexts, and causes. This question is more informative than simply asking whether the technique 'works.'

Outcome transfer also deserves attention. The present test emphasized literal comprehension, which is a legitimate but limited component of reading. Higher-level comprehension includes inference, evaluation, integration of information across sentences, and critical response. A learner might become more efficient at locating explicit details without necessarily becoming better at evaluating an author's assumptions. Future assessments should therefore include separate subscales for literal, inferential, and critical comprehension. Such a design would make it possible to determine whether visual scaffolding supports increasingly complex levels of processing.

Implications for Teacher Education and Classroom Practice

The findings have potential implications for teacher education because Herringbone illustrates how a relatively simple visual tool can be embedded within a structured reading lesson. Pre-service teachers can be trained to begin with explicit modeling: the teacher reads a short passage, demonstrates how to locate evidence for each question, and explains why a particular detail belongs in a particular part of the diagram. Learners can then complete the diagram

collaboratively before attempting it individually. This progression can help teachers move from strategy demonstration toward learner independence.

For classroom implementation, the strategy can also be differentiated. Beginning learners may receive a partially completed diagram, a vocabulary bank, or color-coded evidence in the text. Intermediate learners may receive only the six prompts, while more proficient learners can construct their own organizer and use it to formulate a main idea, summary, or inference. This flexibility is consistent with the principle of scaffolding because support can be adjusted according to learner need rather than applied identically to every student.

The source study also reported that students initially struggled with vocabulary and reading fluency. This observation suggests that teachers should avoid treating Herringbone as a substitute for language development. If students cannot understand key vocabulary, the diagram may simply organize misunderstanding. Pre-reading vocabulary work, contextual guessing, repeated reading, and brief teacher explanation may therefore be necessary components of an effective lesson. The visual organizer is most useful when learners possess enough linguistic access to interpret the information they are asked to organize.

Recommendations for Future Empirical Studies

Future studies can strengthen the evidence base in several ways. First, researchers should report both descriptive and standardized outcomes, including means, standard deviations, confidence intervals, and effect sizes. Second, researchers should describe the intervention sufficiently for replication, including the number and duration of meetings, text characteristics, teacher modeling, pair or group work, and criteria used to judge comprehension. Third, where feasible, researchers should use multiple schools or classes to reduce dependence on one classroom context. Fourth, delayed post-tests can determine whether gains persist after instruction ends.

A further improvement would be to examine mediation or process variables. For example, researchers could ask whether students who complete more accurate diagrams also demonstrate larger reading gains, or whether changes in reading strategy use explain part of the improvement. Qualitative data from learner interviews or think-aloud protocols could complement quantitative scores by showing how students actually use the six questions. Mixed-methods evidence would be especially useful because the Herringbone technique is fundamentally a process-oriented strategy.

Researchers should also preregister or document their analysis decisions where practical. The discrepancy identified in the present article demonstrates how easily a final statistic can become difficult to reproduce when intermediate calculations are not preserved. A clear analysis plan, an anonymized dataset where ethically permissible, and a supplementary calculation file would improve confidence in future findings. These practices are useful regardless of whether the eventual result is positive, null, or mixed.

For IDEAS readers, the article therefore contributes at the intersection of EFL reading pedagogy and quantitative transparency. The Herringbone technique remains the substantive focus, but the manuscript also illustrates a broader research practice: previously collected classroom evidence can be revisited to

provide effect-size information, reproducibility checks, and more cautious interpretation. Such reanalysis is most valuable when it is explicitly disclosed, grounded in the original record, and accompanied by clear acknowledgement of what the data cannot establish.

The present article also demonstrates that a more detailed analysis can change the narrative of an earlier study without changing its underlying classroom events. The original intervention, participants, texts, and instructional sequence remain the same. What changes is the analytical lens. Instead of treating the result primarily as a threshold decision based on t and t -critical, the reanalysis considers how much learners improved and how large the between-group difference was. This distinction is useful for teacher educators and researchers because instructional decisions depend not only on whether a difference exists but also on its size, context, and feasibility.

The distinction between association and causation is particularly important because the source study did not randomly assign individual students to conditions. Class-level selection can preserve pre-existing differences in classroom climate, teacher interaction, peer dynamics, or academic readiness. Although the pre-test means were reasonably close, similarity in a single mean does not guarantee equivalence across all relevant characteristics. Future studies can strengthen causal inference by using several classes, matching groups on baseline reading ability, or applying cluster-randomized procedures when school conditions permit. Such improvements would allow researchers to determine whether the large difference observed here is replicated under stronger controls.

Taken together, the descriptive and standardized results provide a coherent picture within the boundaries of the dataset. The Herringbone group did not simply obtain a higher final mean; it also showed a larger change from baseline, a higher normalized gain, and a large standardized difference in gain scores. The convergence of these indicators strengthens the descriptive interpretation that the Herringbone condition was associated with greater progress during the instructional period. Nevertheless, the evidence remains contextual. The study involved two intact classes, one school, one text genre, and a short intervention. The appropriate conclusion is therefore that the Herringbone-supported instructional package produced a substantial observed difference in this setting, not that the technique has a universally fixed effect.

Conclusion

This article reanalyzed an existing quasi-experimental dataset on Herringbone-supported reading instruction for eighth-grade EFL learners at MTs Negeri 1 Palu. The Herringbone group improved from 41.85 to 72.22, while the control group improved from 44.44 to 60.92. The difference in mean gain was 13.89 points, normalized gain was 0.52 versus 0.30, and the standardized gain difference was very large (Cohen's $d = 2.55$; Hedges' $g = 2.52$). The recalculated gain-score test was $t(52) = 9.39$. These results provide stronger quantitative evidence of a substantial learning advantage associated with the Herringbone condition in this dataset.

The main contribution of the article is methodological transparency: it demonstrates that an established classroom study can yield a more informative

interpretation when gain magnitude and effect size are reported alongside statistical significance. Because the data have already appeared in a 2019 publication, however, the manuscript should be submitted only as a clearly disclosed secondary reanalysis if IDEAS and the relevant rights holders permit such a submission. Future primary research should test Herringbone with larger and more diverse samples, stronger randomization, and assessments that separately capture literal, inferential, and critical comprehension.

Acknowledgement

The authors acknowledge the school, teachers, and students involved in the original data collection. Because this manuscript is a secondary reanalysis, no new participant data were collected for the present article.

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