

Recounting and Justifying Data Analysis Procedures in Experimental Studies: An Investigation into Research Reports on Language Education

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Abstract. Teaching undergraduates how to write research methods constitutes an important component in a dissertation writing programme. One of the challenges encountered by novice writers in language education has to do with the descriptions and justifications of data analysis procedures in experimental research reports. Adopting a genre-based approach, this study analyses the rhetorical strategies and linguistic resources used for recounting and justifying the steps taken in analysing data. Employing the Statistical Package for Social Sciences (SPSS), the researcher conducted a quantitative analysis of the rhetorical steps used by experienced writers in 32 experimental research reports published in eight reputed international refereed journals. Attention was then directed to the determination of the degree to which the frequencies of the steps under investigation-focused headings differ from those under procedure-focused headings. A detailed qualitative analysis of the writers' textual data was also conducted to identify the broad spectrum of language mechanisms employed in recounting and justifying the data analysis procedures. The findings have shed some light on what and how dissertation supervisors and instructors can possibly highlight while guiding second language writers to recount and justify data analysis procedures in experimental studies on language education.

Keywords: Writing Research Reports; Genre Analysis; Language Education; Data Analysis.

1. Introduction

Our experience in supervising postgraduate and undergraduate students in the writing of research reports and dissertations has revealed that students are often unsure about how they can systematically and convincingly present different kinds of information in the section or chapter on research methods. In this regard, books on educational research methods [1, 2] have highlighted the need to include specific components, comprising "subjects" or "sample", "materials" and/or "instrumentation", and "procedures" (i.e. 'data collection procedures') and data analysis (or 'data analysis procedures'). One of the components in which novice writers encounter difficulties has to do with the presentation of data analysis procedures. Students are uncertain as to (i) whether a brief mention of the data analysis package would be sufficient, and (ii) whether such descriptions of data analysis procedures need to be followed by related justifications. More importantly, student writers commit a large number of errors in the writing of data analysis procedures, thus prompting supervisors to ponder upon the need to come up with a framework that can assist novice researchers to present data analysis procedures using appropriate language resources. Motivated by such concerns, this study was conducted to (i) determine the prominence of data analysis procedures as a rhetorical move, (ii) identify the communicative resources (rhetorical strategies and language mechanisms) needed to elucidate data analysis procedures. [A 'rhetorical move' in this context is defined as "a rhetorical unit that performs a coherent communicative function in a written or spoken discourse" [3], and it may be realised in the form of a clause, a sentence or several sentences.]

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The rationale for conducting this study is based on two major observations of results reported in past studies. First, past research has shown that the frequencies of ‘elucidating data analysis procedure/s’ vary across disciplines, and we are uncertain with respect to the prominence of this important rhetorical move in some disciplines, such as language education. For instance, in Kanoksilapatham’s [4] study, only 13.3% of the biochemistry research papers incorporated descriptions of data analysis procedures (i.e. statistical procedures). More interestingly, Li and Ge’s [5] study of the medical research reports has shown that there has been a significant increase in the prominence of ‘elucidating data analysis procedures’ in recent years. Their claim was grounded on the finding that the elucidation of data analysis procedures was found merely in 40% of the older medical experimental research reports (published during the period from 1985 to 1989), but its occurrences increased significantly to 96% in the corpus of recently published medical research reports (published during the period from 2000 to 2004). The prominence of data analysis procedures has been ascribed to the need to enhance the dependability, accuracy, and aptness of the findings to be reported subsequently in the Results section [5]. While the prominence of this rhetorical move in medical RAs in recent years is well demonstrated in their study, we are uncertain as to whether the elucidation of data analysis procedure is also prominent in language education, which bears the characteristics of two related disciplines, namely (i) linguistics which is a discipline in humanities, and (ii) education which is considered as a social science discipline.

Second, the need to conduct this study is based on our observation that past research [4, 5] has devoted less attention to the linguistic realizations of ‘elucidating data analysis procedures’. For instance, Li and Ge [5] found that (i) the simple past tense was more prevalent than the simple present tense and the present perfect tense in medical research articles, and (ii) the plural form of the first person pronouns was also more prominent in the medical corpus. Nonetheless, their findings on linguistic features were about research reports as a whole and not about this important rhetorical move on data analysis procedures in particular. As such, we are uncertain in regard to the salient linguistic features of ‘elucidating data analysis procedures’ which, according to our experience in supervision, appears to be a noteworthy portion in which novice writers have encountered problems in terms of both content and language. Analysing these segments will also provide us with adequate related instances that can be used in (i) pre-writing instructional sessions, and (ii) post-writing corrections and explanations.

Motivated by the need to enlighten novice researchers in their reading and writing of the Method section in experimental studies on language education, this genre-based study seeks to answer the following three research questions:

- (1) What are the communicative functions of ‘elucidating data analysis procedures’ in experimental research reports on language education?
- (2) Do the frequencies of the rhetorical steps in presenting data analysis procedures in these experimental reports largely hinge on the types of headings that the writers use?
- (3) What salient language mechanisms are used to present data analysis procedures in research reports on language education?

2. Method

To answer the aforementioned research questions, a total of 32 experimental research reports on language education were selected from eight different international refereed journals published from 2004 to 2008, including *Applied Linguistics*, *TESOL Quarterly*, *Studies in Second Language Acquisition*, *Language Teaching Research*, *Journal of English for Academic Purposes*, *International Review of Applied Linguistics in Language Teaching*, *System*, and *RELC Journal*. The sample was purposive in that four articles from each journal, was chosen using the researcher’s “experience and knowledge of the group to be sampled” [6] (p. 134). The selection criteria were such that the papers had to be (i) those published in reputed international refereed journals, and (ii) closely associated with experimental research on language education. The research procedures in some of these journals are presented in sections under investigation-focused headings, such as ‘The Study’ or ‘The Experimental Study’ rather than method-focused headings (such as ‘Research Design’ or Method/s’). Based on Lim’s [7] and Pho’s [8] classifications, they are considered as ‘Method sections’. The findings obtained on the recounting and justification of data analysis procedures are therefore generalisable to the language education research articles exhibiting the aforementioned characteristics. Two

specialist informants who had published experimental research articles in reputed international refereed journals on language education were then interviewed to (i) provide views on the rationale for elucidating data analysis procedures in the discipline, and (ii) determine the degree of acceptability of the communicative functions involved in describing the procedures. Their spoken data in the face-to-face interviews were recorded digitally and analysed to provide additional data for the textual analysis.

The generic organisation of the articles was analysed prior to studying (i) the schematic structure of the sections containing data analysis procedures, and (ii) the important language mechanisms used to realise each rhetorical move and constituent step. Swales' [3, 9] 'move-step analysis' was first used to examine the Method sections using a contextual procedure that focused on communicative functions. The researcher analysed the genre with reference to distinct units in a hierarchically organised framework in which a section was divided into communicative moves that were then subdivided into rhetorical steps. Attempts were first made to see whether it was possible to distinguish descriptions of data analysis procedures from other co-occurring rhetorical categories in the Method sections. The unit of analysis was a rhetorical step realised minimally as a T-unit, which is defined as "an independent clause and all of its dependent clauses" [10] (p. 79). The occurrences of each step were marked in each RA so that its frequency could be determined.

The frequencies of the related rhetorical steps were subsequently counted with reference to the number of times each step appeared without being interrupted by any other step. The researcher then conducted the Mann-Whitney U-tests to determine the degree to which these frequencies were dependent on the major headings under which the segments appeared. The analysis of salient linguistic choices was conducted using the (i) linguistic descriptions provided by Quirk, Greenbaum, Leech, and Svartvik [11] and Greenbaum and Quirk [12], and (ii) descriptions of research-related language illustrated by Thomas and Hawes [13] and Lim [7, 14, 15] for the research genre.

3. Results and Discussion

Based on the research methods reported above, two rhetorical steps connected with the elucidation of data analysis procedures have been identified, and they are 'recounting data analysis procedures' and 'justifying data analysis procedures' (see Table 1).

Table 1: Frequencies of justifications of data analysis procedures in Method-related sections

Rhetorical step/s	Step 1	Step 2	Steps 1 and 2
No. of reports containing the step/s	21	14	22
Frequency of the step/s under method-focused headings	33	13	46
Frequency of the step/s under investigation-focused headings	21	12	33
Total frequency of the step/s in all Method sections	54	25	79
Mean frequency	1.69	0.78	2.47
SD	1.768	1.128	2.590

Both specialist informants have acknowledged the frequent incorporation of these two distinctly separate rhetorical steps in their Method sections on experimental research reports on language education. With respect to justifications, specialist informant A (SIA) has considered the incorporations of justifications for data analysis procedures as optional and dependent on the writers' needs. The informants also highlighted the necessity to include justifications in cases where a procedure is "not really mainstream". This means that when data analysis procedures are deemed not readily accepted by the academic research community, related justifications would become essential, and this is usually done via citations of past researchers who used the procedures concerned.

Given the informants' spoken data and the general features of 'elucidating data analysis procedures', we can now discuss the frequencies of these steps to provide an overview of their degrees of prevalence in Method sections 1 through 32 (i.e., M1 – M32). Table 1 illustrates that 'recounting data analysis procedures' appears in the majority (i.e. 65.6% or 21/32) of the experimental research reports on language education, with 1.69 occurrences per Method section.

'Justifying the data analysis procedures', however, occurs in less than half (i.e. 43.8% or 14/32) of the research reports, with 0.78 occurrence per Method section. Subsequently, Mann-Whitney U-tests were conducted to determine the inter-heading differences in the occurrences of both steps in the corpus. [The

Mann-Whitney U-tests were used instead of independent samples t-tests because the occurrences were not normally distributed for all the constituent steps.] Table 2 shows the asymptotic values for these steps:

Table 2: Asymptotic significance values indicating inter-heading differences with reference to occurrences of steps 1 and 2

Rhetorical category	Mann-Whitney U statistic (U)	Asymptotic value(2-tailed)
Step 1	108.500	0.554
Step 2	105.500	0.442
Steps 1 and 2	115.500	0.754

Given that the asymptotic values for the two steps in the Method sections are above the cut-off point of 0.05, there are no significant inter-heading differences in the occurrences of both steps 1 and 2. This means that occurrences of these steps exhibit no significant differences across papers with procedure-focused headings and investigation-focused headings.

3.1. Step 1: Recounting data analysis procedure/s

This step involves a recount of the steps taken in analysing the collected data. A distinct feature of step 1 is the use of verbs denoting arithmetical calculations. These passive procedural verbs denoting arithmetical calculations (e.g., ‘were tallied’, ‘were combined and averaged’, ‘were computed’, ‘were subtracted’, ‘were calculated’, ‘were counted’, etc.) normally appear in the simple past tense as exemplified in Table 3:

Table 3: Instances of ‘recounting data analysis procedures’ using additive/temporal linkers and passive procedural verbs in Step 1

Linguistic choice	Segment containing ‘recounting data analysis procedure’
Using additive linkers and passive procedural verbs in the simple past tense	The 5 listeners’ average ratings <u>were combined and averaged</u> to obtain a measure of each speaker’s accent. The results (i.e., the accent scores for each of 16 speakers at two times) formed the <u>baseline measure</u> for accent. (M5: 447) All scores <u>were entered</u> into SPSS (2002) <u>and</u> a range of descriptive and inferential statistics <u>were computed</u>(M8: 269)
Using temporal linkers and passive procedural verbs in the simple past tense	A total of the semantic units reported under each condition <u>was then calculated and expressed as a percentage of all possible semantic units</u> (35 x 10 for each condition). (M27: 89) An accuracy <u>score was then calculated</u> for each learner <u>by dividing</u> the total number of correctly supplied articles <u>by</u> the total number of obligatory occasions and expressed as proportions of 1. (M28: 361)
Using passive procedural verbs and mathematical equations to indicate the steps taken in analysing data	In the interpretation task the raw scores <u>were calculated</u> as follows: incorrect response = 0 point; correct response = 1 point. (M13: 79) Articles <u>were first scored</u> for correct use in obligatory contexts. This score <u>then</u> became the <u>numerator of a ratio whose denominator</u> was the <u>sum</u> of the number of obligatory contexts in which articles were supplied inappropriately. The scoring formula is shown in the following equation: $\frac{n \text{ correct suppliance in contexts}}{n \text{ obligatory contexts} + n \text{ suppliance in nonobligatory contexts}} \times 100 = \text{percent accuracy}$ (M8: 266)

These passive verbs are generally preceded by noun phrases denoting dependent variables, such as the numbers of language structures, frequencies of errors, and performance scores in experimental research. Writers usually employ additive linkers or temporal linkers (e.g. ‘and’, ‘then’, etc.) and noun phrases denoting arithmetical calculations (e.g., ‘percentage’, ‘ratio’, ‘baseline measure’, etc.).

The use of passive verbs or phrasal verbs denoting conceptualization (e.g., ‘were treated as’, ‘were counted as’, ‘was accepted as’, etc.) also constitutes a salient feature of this step as exemplified below:

- (1) If a learner reported noticing in at least two-thirds of the possible contexts, they were considered to have ‘high’ reports of noticing. (M2: 418)
- (2) Noun phrase calculation was based on the following rules: conjoined NPs were counted as single units; complex NPs (NPs with embedded NPs) were treated as single units and pronouns were ignored. (M31: 335)
- (3) In the case of contexts requiring the indefinite article, either ‘a’ or ‘an’ was accepted as correct irrespective of which form of the indefinite article the context required.... (M28: 361)

The passive verbs are used to indicate how the data collected could be conceptualised in the researchers’ attempt to record the values that would be analysed subsequently.

A more prominent structure existing in step 1 is the subject-predicator-adverbial (SPA) structure as shown in Table 4:

Table 4: SPA structures comprising means adjuncts used in recounting data analysis procedures in Step 1

Subject [Noun phrase referring to data (obtained using the instrument), finding/s or decision/s]	Predicator (passive procedural verb in the simple past tense)	Adverbial/s (means adjunct explaining how variable/s was analysed)
The cross-language identification responses	were scored	by computing how many times (out of 15) each participant identified English /ð/ tokens in a given context (or, in the case of the control stimuli, tokens of French /s/) with any of the 11 response alternatives. (M11: 425)
The production score	was derived	by averaging the 10 listeners' correct identification rates for each participant's 18 words. (M22:238)
Normality of the data	were achieved	by detecting outliers for each variable by means of box plots and eliminating them from the count. (M23: 226)
The results (see Fig. 1)	were obtained	by calculating the number of semantic units from the materials that were reported by students in the written summary... (M27: 89)
The scores for the narrative writing tests	were analysed	by means of a repeated measures ANOVA (3 groups x 3 times) with post-hoc one-way ANOVAs. (M28: 361)
The quantity and quality of pausal units	was determined	by asking eight university colleagues to assess pausal boundaries and importance levels. (M31: 335)

Segments in this step usually consist of predicators in the form of passive procedural verb phrases in the simple past tense, which are (i) preceded by sentence-subjects comprising noun phrases referring to phenomena, findings or characteristics of variables, and (ii) adverbials consisting of *means adjuncts* explaining how variables are measured (e.g., 'by computing how many times...', 'by detecting outliers for each variable', etc.).

As data analysis revolves around coding of data collected, step 1 is frequently associated with descriptions of conditions and situations in which the data should be coded in accordance with pre-determined criteria. This explains why temporal and conditional clauses are prominent in this step. Instances of these clauses are provided as follows:

- (4) Only suppliance/nonsuppliance in unambiguous contexts was coded... This meant that some possible errors were ignored. Exceptions are noted in the points that follow. 2. In the case of the word prompt park, both "in the park" or "in a park" were possible, so NPs containing this word were excluded from coding... (8: 266)
- (5) There were four possible codings in this system: (a) partially changed (PC), if at least one error from the original T-unit was changed in the direction of the feedback; (b) completely corrected (CC), if all of the errors from the original T-unit were corrected; (c) completely unchanged (UC); or (d) not applicable (NA), if there had been no errors in the original T-unit or if the T-unit had been added or deleted. We considered the PC and CC categories to show changes in accuracy, or at least some type of restructuring, whereas the UC category showed no evidence of this...(M10: 79)
- (6) When a student simply wrote a word or phrase that was associated with the semantic unit, the item was scored as being 'understood' even if grammatically inaccurate as this did not indicate a failure...(M27: 89)

As shown above, *situational adjuncts* (e.g., 'In the case of the word prompt park') and temporal/conditional clauses (e.g., 'When a student simply wrote a word or phrase that was associated with the semantic unit', , if at least one error from the original T-unit was changed in the direction of the feedback, etc.) are often used to indicate the context in which the data need to be coded in the analysis process.

The aforementioned temporal/conditional clauses may occur in two ways as shown in Table 5. The first recurrent pattern involves the use of a subordinate temporal clause (indicating the situation encountered by the coders) before a matrix clause stating how the data were coded.

Table 5: Instances of 'recounting data analysis procedures' using conditional and temporal clauses in Step 1

Sentence Structure	Segment containing 'recounting data analysis procedure' with optional adverbials in some cases	
Subordinate temporal clause preceding matrix clause	<u>When it was not clear whether</u> a noun phrase (NP) constituted an obligatory context for <i>a</i> or <i>the</i> based on the student's writing,	the NP <u>was not coded</u> . (8: 266)
	<u>However, when</u> neither article was present in the NP,	it <u>was coded as</u> nonsuppliance. (8: 266)
Matrix clause preceding subordinate	<u>As such</u> , the participant's <u>accuracy</u> in a given context <u>is scored as 1</u> (consistently right)	<u>if</u> the mean accuracy rate in that context <u>is at least 80%</u> (i.e., no fewer than 8 out of 10 English /ð/ tokens on average marked as right). (M11: 416)

conditional clause	The learners' responses <u>were deemed</u> "correct"	<u>if they marked the same response</u> to their speech as was marked by the English listeners in Experiment 1 (whether it was the intended word or not). (M22: 244)
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The second prevalent structure requires the use of a matrix clause (stating the decision on the way in which the data were coded) prior to a subordinate conditional clause which depicts the situation in which data of certain values were obtained.

Given that 'recounting data analysis' frequently involves descriptions of situations in which coding was done, it is understandable that expressions indicating aspects that have been given the focus often constitute a salient characteristic of this step. Instances of such indications are shown as follows:

- (7) The language analysis test was scored on a discrete item basis with 14 points being the perfect score. (M8: 268)
- (8) Again, all of the errors were coded separately by the researchers and tallied with regard to the number and type of errors that had occurred in each version... (M10: 78-79)
- (9) Not only did we count the number of Errors made by each student, but also classified the exercises according to the percentage of wrong answers chosen.... (M17: 169)
- (10) For the individual role-play task, each subject received two scores... For the small-group interaction task, each subject was awarded an overall impression score (B) from 0-7 based on his/her participation in the group discussion... (M29: 349)

The instances given above show that prepositions are often used before noun phrases denoting the aspects focused upon in data analysis (e.g., 'on a discrete item basis', 'with regard to the number and type of errors', 'according to the a the percentage of wrong answers chosen', 'based on his/her participation in the group discussion', etc.). Aside from the procedural verbs denoting arithmetical calculations explained above, this sub-step is also characterised by past tense verbs indicating conferment/reception (e.g., 'received', 'was awarded', etc.).

Verbs denoting execution (e.g., 'were performed', 'was carried out', 'were carried out', etc.) also form a prominent feature of 'recounting data analysis procedure' as exemplified below:

- (11) Then one-way ANOVAs with posthoc multiple comparison tests using Tukey, repeated measures ANOVAs, and ANCOVAs were performed, followed by Pearson product moment correlation. (M8: 269)
- (12) The transcription of the narratives was carried out by the researcher and two research assistants. (M23: 226)
- (13) Repeated measures analyses of variance (ANOVA) of the nine dependent variables were carried out... (M23: 222)

The instances above show that the *execution verbs* are always in the simple past tense and the passive voice. These verbs generally collocate with sentence-subjects referring to analysis procedures instead of data or participants.

Apart from execution verbs, passive usage verbs in the simple past tense also constitute a salient feature of step 1. Instances of such usage verbs (in the prevalent SPA structure) are shown in Table 6.

Table 6: SPA structures comprising usage verbs and infinitive clauses in Step 1

Subject (noun phrase denoting method/s of analysis)	Predicator (passive usage verb in the simple past tense)	Adverbial/s (infinitive phrase indicating purpose of using the analysis procedure)
The TLU analysis	<u>was used</u>	<u>to measure learners' knowledge</u> of articles by taking overuse of the target form into consideration. (M8: 266)
The 'Independent Sample T-Test' method	<u>was applied</u>	<u>to work out</u> the results of the experimental and control groups. (M19: 438)
T-tests	<u>were used</u>	<u>to determine if</u> there were <u>differences in the mean scores</u> of first year students on selected variables. (M25L 355)

These predicators are generally (i) preceded by sentence-subjects denoting methods of analysis, and (ii) ensued by infinitive phrases (e.g., 'to measure learners' knowledge of articles by taking overuse of the target form into consideration', 'to work out the results of the experimental and control groups', etc.).

3.2. Step 2: Justifying data analysis procedure/s

This step is closely connected with inter-rater reliability (not internal consistency reliability) which should be considered as part of the data analysis procedure because the reliability is measured only after the data have been collected, and when the inter-rater reliability is based on values obtained after the data have been analysed. The following instances illustrate how distinct justifications are provided:

- (14) This was done so that the three stages, along with the transcripts of the think-alouds (where applicable), could be compared directly with each other, side by side, in order to evaluate changes in accuracy from one version to the next and to investigate any relationships between reported awareness and revision changes. (M10: 79)
- (15) To increase the chances of obtaining acceptable reliability, assessors of oral proficiency can of course be helped by detailed guidelines reminding them of different aspects of language use to be taken into account...If different interviewers show a similar appreciation of an interviewee's performance, then this is at least an indication that this interviewee's level of oral proficiency is likely to be perceived similarly by different interlocutors. (M15: 252)
- (16) They allow quantitative analysis to be carried out and offer an objective view of the situation under investigation. (M17: 170)
- (17) The correct selection of NPs was confirmed by two other raters. Acceptable and exact word scoring were used... (M31: 335)

As shown above, justifications generally incorporate (i) noun phrases containing adjectival pre-modifiers indicating acceptability (e.g. 'acceptable reliability', 'detailed guidelines', 'acceptable and exact word scoring', etc.), (ii) predicator-adverbial (PA) combinations signalling precision and comparability (e.g. 'could be compared directly', 'to be perceived similarly', etc.), and (iii) predicator-object combinations indicating reliability and objectivity (e.g. 'to increase the chances of obtaining acceptable reliability', 'show a similar appreciation', 'offer an objective view', etc.).

Another form of justification for data analysis procedure/s has to do with inter-rater agreement. Given that inter-rater agreement refers to the extent to which the data have been rated or analysed in an acceptable way, it should be considered as a form of justification for the data analysis procedures. Instances of justifications that focus on inter-rater agreements are provided in Table 7. Justifications of data analysis procedures that focus on inter-rater agreements generally appear in three principal structures. First, writers may use noun phrases denoting degrees of agreement (e.g., 'interrater agreement', 'higher levels of reliability', etc.) in the sentence-subject position. Most of these instances involve the use of copular verbs (e.g. 'was', 'were', etc.) in post-predicator positions. Second, authors may use a noun phrase denoting an analysis procedure in the sentence-subject position (e.g. 'the coding system', 'inter-rater reliability analyses', etc.) followed by a transitive predicator and object (PO) indicating a considerably high degree of inter-rater reliability [e.g., 'had an 85.3% interrater agreement', 'yielded moderate to very high indexes (a range: .70-.99)', etc.] (see Table 7).

Table 7: Instances of 'justifying data analysis procedures' that focus on inter-rater agreements

Linguistic choice	Segments of Move 5-Step 1 pertaining to inter-rater agreements
Using noun phrase s denoting degrees of agreement in sentence-subject positions	Because all of the individual errors had already been coded, <u>interrater agreement was very high</u> , at <u>over 99%</u> . (M10: 79) In the dictation test, the <u>percentage agreement scores were</u> 89.3%, 87.2%, 91.4%, respectively. In the writing test, the <u>percentage agreement scores were</u> 78.4%, 83.3%, 79.2%, respectively. Although <u>higher levels of reliability</u> for the writing test are <u>desirable</u> , <u>the levels achieved</u> all <u>exceeded 75%</u> , which is <u>satisfactory</u> . (M8: 268) <u>Correlation between acceptable and exact scoring was</u> 0.899. (M31: 335)
Using noun phrases denoting analysis procedures in sentence-subject positions	<u>This coding system had an 85.3% interrater agreement</u> . (M10: 79) <u>Interrater reliability analyses</u> comparing accuracy ratings within the first listener group (using the original 40 recordings) and within the two listener groups combined (using a subset of 7 recordings) <u>yielded moderate to very high indexes</u> (a range: .70-.99), which suggests that the listeners were <u>consistent in their judgments</u> . (M11: 416)
Using noun phrases denoting raters in sentence-subject positions	Of the 3740 scores that each rater assigned in total, <u>the two raters assigned identical scores</u> in 3115 cases (83.3%). (M12: 465) In one case (immediate receptive performance on idiom 4), <u>both raters assigned the same score to all participants</u> ($n = 57$)...Because of <u>this high agreement between the raters</u> , the scores of the first rater

were used for subsequent analyses. (M12: 465)

Prior to the experiment, 10 native speakers of English identified the stimuli with a 98% accuracy in an open-choice identification task. (M22: 236)

Third, writers often use noun phrases denoting raters (in data analysis procedures) in sentence-subject positions (e.g., ‘the two raters’, ‘both raters’, ‘10 native speakers of English’, etc.) ensued by the transitive predicators in the form of active procedural verbs and subsequent phrases indicating high degrees of agreement (e.g., ‘assigned identical scores’, ‘assigned the same score to all participants’, ‘identified the stimuli with a 98% accuracy’, etc.).

A more important salient feature of such justifications has to do with the use of an intra-step shift (i.e., a shift from a segment with a communicative function to another segment with a related function within the same step) from an indication of agreement to an acknowledgment of disagreement between raters while justifying a data analysis procedure (see Figure 1).

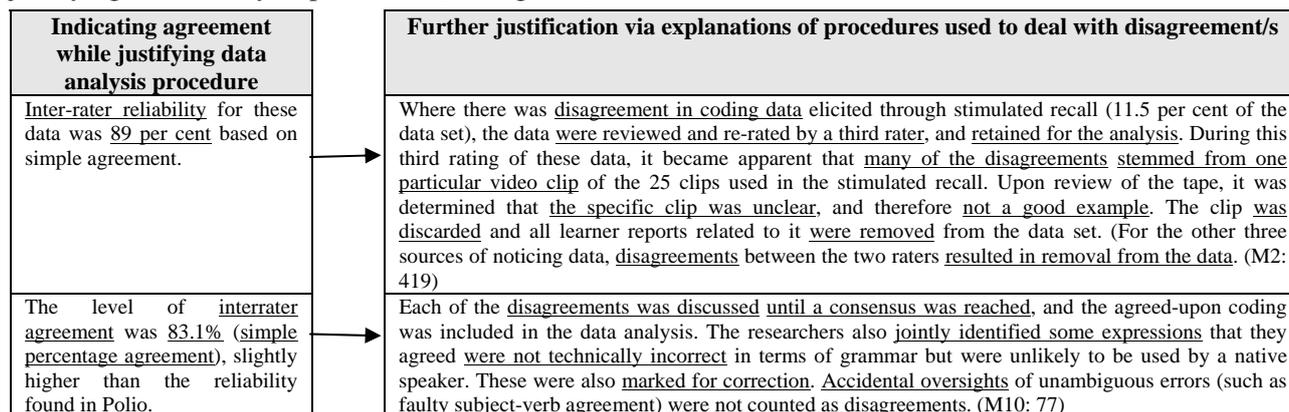


Figure 1: Shifts from indications of agreement to acknowledgments of disagreement

Candid acknowledgments of the parts in which raters initially or eventually disagreed actually convey an overall positive message about the acceptability of the analysis procedure. This is an important sub-step in which writers augment the reliability of their analysis procedures (and that of the results to be presented subsequently) by clearly stating that portions (where disagreements emerged) were excluded from the data analysed.

The aforementioned justifications involving points of disagreement are characterised by the use of predicator-adverbial (PA) combinations denoting exclusion (e.g., ‘were removed from the data set’) each of which contains a past tense verb followed by a prepositional phrase. These PO combinations are generally preceded by expressions denoting disagreements and mistakes (e.g., ‘Disagreements in the test data that were coded by more than one rater’, ‘Accidental oversights of unambiguous errors’, etc.). These expressions that acknowledge weaknesses discovered in the analysis procedures are often used in combination with verb phrases indicating subsequent repeated evaluation (e.g., ‘were reviewed and re-rated’, ‘was discussed until a consensus was reached’, etc.). While the aforementioned shifts appear within a rhetorical step pertaining to justifications, Figure 2 lucidly demonstrates the shifts involving inter-step transitions from ‘recounting data analysis procedure’ to ‘justifying data analysis procedure’:

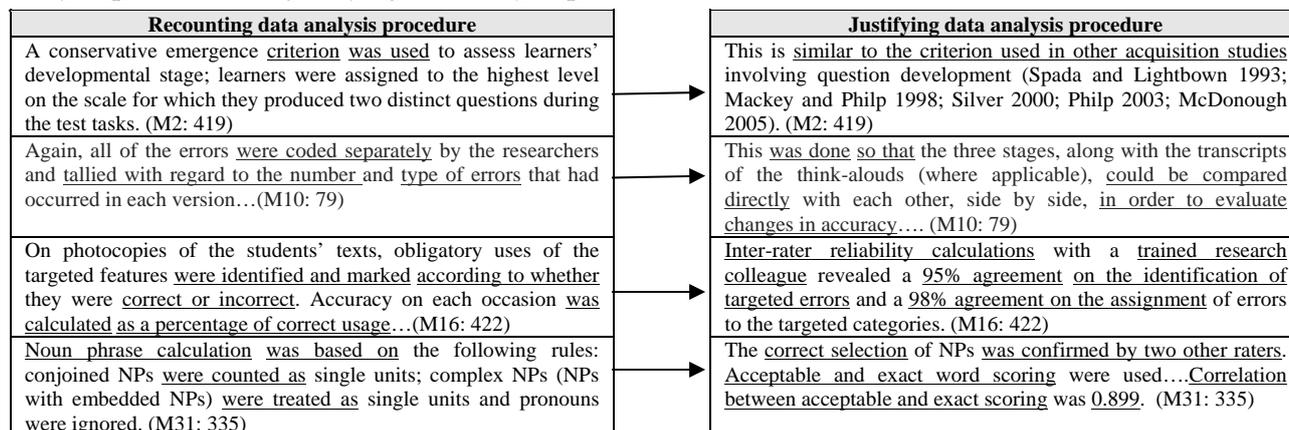


Figure 2: Shifts from the recounting of data analysis procedures to their supporting justifications

As shown above, shifts usually occur under several circumstances. First, when a certain analysis criterion is used, writers generally cite some similar criteria used in past research as a form of justification, thus giving readers an impression that the criterion is part of a time-tested procedure with a proven record (as shown in the instances extracted from M2). Second, after writers have stated that their data were analysed separately by different raters in step 1, they may proceed to provide reasons pertaining to the comparability of the data in stages via step 2 (see the second instance from M10). Third, after the method of calculation has been described in step 1, writers may immediately support it (with numerical values indicating a high level of agreement (as shown in the examples from M16 and M31).

4. Conclusions and pedagogical implications

This study has resolved several important issues connected with the prominence, rhetorical strategies and language resources needed in elucidating the data analysis procedures of experimental research reports on language education. ‘Elucidating data analysis procedures’ is realised in two distinct ways via (i) recounts of the data analysis procedures which occurs in nearly two-thirds all of the reports, and (ii) justifications of the procedures that appear in less than half of the reports. Like medical research articles [5], ‘elucidating data analysis procedures’ occurs in most of the experimental research reports. While step 1 focuses on recounting how the data were processed, treated and illustrated in an analysis, step 2 demonstrates the acceptability of the data analysis procedures via citations of past research procedures and explanations about the extent to which the expected methodological shortcomings have been minimised.

Using the Mann-Whitney U-tests, we have confirmed that the frequencies of both steps are not contingent upon the differences between the procedure-focused and investigation-focused headings of the Method-related sections. In experimental studies, supervisors and instructors may therefore allow novice writers to incorporate step 1 under either a procedure-focused heading or an investigation-focused heading as they do not imply significantly different frequencies in the recounting and justification of data analysis procedures.

In the language training given to novice writers, attention may first be directed to the passive forms of procedural verbs, usage verbs, and execution-related verbs in the simple past tense. Novice writers can also be given relevant exercises requiring them to use (i) phrasal verbs denoting conceptualization, and (ii) procedural verbs denoting arithmetical calculations. Using the instances in Table 3, instructors may introduce these past tense verbs to learners in pertinent contexts requiring the use of appropriate additive and temporal linkers so that learners can be trained to construct sentences expressing past successive actions taken in analysis procedures. In this regard, the syntactic structures to be incorporated may include the SPA structures, as shown in Tables 4 and 6, in which predicators in the form of passive procedural or usage verbs are ensued by adverbials comprising either (i) *means adjuncts* explaining how variables are measured, or (ii) infinitive clauses expressing the purpose of using the data analysis procedures. In cases where novice researchers need to indicate the context in which the data are coded, instructors need to direct learners’ attention to the use of temporal and conditional clauses which engage *situational adjuncts* that describe the coding processes.

We also recommend that novice writers incorporate detailed justifications using citations of past researchers’ data analysis procedures, particularly in cases where a procedure is not really a ‘mainstream’ or established procedure in language education. In cases where overt justifications are needed, instructors may highlight the use of noun phrases containing adjectival pre-modifiers indicating acceptability, predicator-adverbial combinations signalling precision and comparability, predicator-object combinations indicating reliability and objectivity, and noun phrases denoting inter-rater agreements. More specifically, to familiarise learners with the specific rhetorical development of justifications, the intra-step shifts (as demonstrated in Figure 1) can be used to demonstrate how an indication of inter-rater agreement may be supported by explanations about how disagreements were appropriately dealt with. To help novice writers distinguish ‘recounting data analysis procedures’ in step 1 from their related justifications in step 2, inter-step shifts (as illustrated in Figure 2) may be demonstrated to learners in pre-writing activities. Guiding novice researchers in the presentation of data analysis procedures clearly requires an in-depth understanding of a wide range of rhetorical strategies and language resources. Citing similar analysis criteria employed in past research

constitutes one of the pervasive strategies used to highlight the ‘time-tested nature’ of a data analysis procedure in this long-established social science discipline. Providing pertinent reasons for the comparability of the data and highlighting the strengths of new procedures are common strategies used to enhance the acceptability of the procedures concerned. In brief, experienced writers’ descriptions and justifications of data analysis procedures are not merely restricted to the use of numerical values indicating reasonable levels of agreement, but may include a broad spectrum of language expressions that demonstrate sufficient consideration of the objectivity and acceptability involved in data analysis procedures.

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