

## Research on T-unit Measures in ESL

Kinue HIRANO\*

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### ABSTRACT

This present paper reviews research on T-unit measures of writing ability and overall language development in ESL, and examines some problems related to T-unit measures.

The results from first language research have indicated that on an overall basis mean T-unit length is a more satisfactory index of syntactic complexity to measure first language development. On the other hand, many second language researchers have found error-free measures as well as unmodified T-unit length to provide objective and useful indices of writing ability or overall second language proficiency. However, in spite of the advantages of their very ease and objectivity, some fundamental questions related to T-unit measures are pointed out.

### KEY WORDS

error-free T-units, ESL T-unit measures, language proficiency, writing ability

Since the studies of Hunt (1970, 1977), the T-unit has become very popular as an index of syntactic complexity in speech and writing samples. The T-unit (first used by Hunt 1965) has been widely applied in a large amount of first language (L1) and second language (L2) research, research in the chronological development of syntactic maturity, the effects of writing instruction (e.g., sentence-combining exercises) and curricular activities on students' writing, the effect of mode or audience on written and spoken texts, the difference between written and spoken style, the syntactic nature of linguistic input and others.

The purpose of this study is (1) to review research in T-unit measures of writing ability and overall language proficiency in English as a second language (ESL) and (2) to discuss some problems related to the validity and reliability of T-unit measures, and T-unit analysis in general.

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\* Department of Languages

## AN INDEX OF SYNTACTIC COMPLEXITY IN L1 RESEARCH

The T-unit (or the minimal terminable T-unit) was first developed by Hunt (1965) as a measure of syntactic maturity in the writing of English-speaking schoolchildren. Hunt (1970) has defined it as "a main clause plus all subordinate clauses and nonclausal structures attached to or embedded in it" (p. 4). Hunt (1965) states that "each would be grammatically capable of being terminated with a capital letter [at one end], and a period [at the other]" (p. 21). For example, a simple or a complex sentence constitutes one T-unit, while a compound sentence consists of more than one T-unit as illustrated in the following examples from Gaies (1980 : 60) :

This woman will get the job done./I've known her for a long time,/so I am confident we can rely on her.

(3 T-units ; mean T-unit length (words/T-unit)=8.00)

This woman, whom I've known for a long time and whom I feel confident we can rely upon, will get the job done.

(1 T-unit ; mean T-unit length=24.00)

Hunt and other first language researchers (e.g., Hunt 1965, O'Donnell et al 1967, O'Hare 1973, Loban 1976, O'Donnell 1976, Freedman 1980) found T-unit length to be a more satisfactory measure of syntactic maturity in comparison with other measures such as the length of clauses, the length of sentences, and the subordination ratio. They have noted that mean T-unit length (the mean number of words per T-unit) increases due to subordination, or extensive use of nonclausal phrases. Overall, the literature in first language research concluded that mean T-unit length increases as language development increases. That is to say, it has been found that more proficient students write fewer but longer T-units than less proficient students.

## RESEARCH ON INDICES OF WRITING PROFICIENCY AND LANGUAGE DEVELOPMENT IN L2

Recently, teachers and researchers in ESL and EFL have become greatly interested in various objective measures of writing proficiency and of overall language development or proficiency to find valid and reliable measures of syntactic complexity or maturity. Since Scott and Tucker's study (1974), the use of error-free T-units as well as T-units has become quite popular in ESL and EFL research.

### Research on T-unit Measures of Writing Proficiency in ESL

On the whole, the results of studies of objective measures of writing proficiency differ

among researchers. For example, Arthur (1979) analyzed the short-term changes in 152 compositions written over a period of 7 weeks by 14 low-intermediate ESL students at the University of Michigan. He investigated the changes of composition skills in terms of nine variables, such as average T-unit length, percentage of error-free T-units, average error-free T-unit length, grammatical error frequency, fluency (average words per minute of writing time), vocabulary size, spelling, punctuation, and grammatical error type. Arthur found that neither the average number of words per T-unit (mean T-unit length) nor the average number of words per error-free T-unit (the mean length of error-free T-units) increased. The most significant changes in compositions were noted in writing speed (the length of composition) and in vocabulary size (the type-token ratio).

Kameen (1979) examined fifty compositions written by college-level ESL students. The compositions were graded by two raters on a scale of 100. Depending on the scores, the compositions were judged as "good" or "poor". Kameen found that the differences between 25 "good" and 25 "poor" writers were statistically significant in T-unit length, clause length and incidence of passive voice.

Flahive and Snow (1980) used a new measure, i.e., the number of errors per T-unit in evaluating 300 compositions written by ESL students at six levels of proficiency. They found the correlations between the T-unit measures such as the length of T-units and the clause per T-unit ratio, and the holistic evaluations of the compositions by experienced ESL teachers. Flahive and Snow reported that these two measures discriminated among different proficiency levels of writing. What is surprising, however, is that the errors per T-unit really lacked this discriminatory power.

Perkins (1980) best illustrates the efficacy of the measures that take the absence of errors into account. He employed ten objective measures of writing proficiency to evaluate compositions written by 29 advanced ESL students. Perkins' investigation focused on the relationship between objective measures and holistic evaluations of ESL writing proficiency. On an impressionistic basis, two experienced teachers assigned each composition to one of three groups, *pass*, *pass minus*, or *fail*. The only four significant discriminators among holistic evaluations were found to be: 1) total number of error-free T-units per composition, 2) total number of words in error-free T-units, 3) errors per T-unit, and 4) total errors. Interestingly, no significant differences were noted in T-unit length and clause/T-unit ratio that Flahive and Snow (1980) found significant. However, the number of errors per T-unit (the nonsignificant measure in Flahive and Snow (1980)) was found to be significant by Perkins. Perkins notes that only those objective measures which take the absence of errors into account discriminate among different holistic evaluations of the compositions at one advanced level of proficiency. This finding is similar to that of Larsen-Freeman (1978) and Van (1979), who have reported that error-free T-units discriminate among different levels of proficiency.

Ho-Peng (1983) used T-unit analysis to assess both free writing and rewriting abilities of 60 ESL students. He found mean error-free T-units per sentence were found to be the

best discriminator among the three proficiency levels of the ESL students. The results indicate that error-free T-unit measures should be used in assessing ESL writing proficiency in order to discriminate among compositions. This study also supports the use of error-free T-unit measures for Larsen-Freeman's ESL index of development.

Using a randomly selected sample of 30 compositions written as part of the Michigan Test of English Language Proficiency, Homburg (1984) examined the relationship between subjective (holistic) evaluation and objective measures of ESL writing proficiency. He found that 84% of the variance of subjective grades was accounted for by five measures: second-degree errors per T-unit; dependent clauses; words per sentence; coordinating conjunctions; and error-free T-units per composition. The validation of holistic evaluation of ESL compositions was found to be adequately supported.

### **Research on an ESL Index of Development**

A number of L2 researchers have attempted to find an appropriate index of second language development or proficiency that will be useful in discriminating among L2 learners at different levels of proficiency.

**Mean T-unit Length.** Some L2 researchers employed L1 T-unit measures without modifying Hunt's T-unit to investigate the similarities in syntactic development between L1 and L2 learners. Cooper (1976, 1981), Monroe (1975), and Kameen (1979) found that mean T-unit length increased with second language proficiency, distinguishing different proficiency levels for German, Spanish, French, and ESL respectively. It has been found that like L1 learners, L2 learners progress syntactically from coordination through subordination to reducing clauses to the phrasal level, although its developmental progress is much more rapid in the second language than in the first (Gaies 1980, Dvorak 1987).

**Error-Free T-units.** A number of L2 researchers (Scott and Tucker 1974; Larsen-Freeman and Strom 1977, Larsen-Freeman 1978; Vann 1979, etc.) have discovered that errors that indicate incomplete syntactic control occur relatively frequently in second language samples. This qualitative difference between L1 and L2 acquisition has developed a modified index, i.e., the T-unit that takes the absence of errors into account—the error-free T-unit.

As in research on ESL writing proficiency, the modified T-unit or the error-free T-unit has been employed in combination with the unmodified one, to find an index of ESL language development. For instance, Scott and Tucker (1974) first adapted the T-unit in the form of error-free T-unit in their investigation of syntactic development of oral and

written samples of 22 Arabic EFL students at a low-intermediate level. Scott and Tucker found linear trends toward higher percentages of error-free T-units as the Arabic students exhibited higher proficiency levels in English.

Larsen-Freeman and Strom (1977), and Larsen-Freeman (1978) have attempted to test the discriminatory powers of error-free T-units in order to find an index of second language development that will distinguish various proficiency levels. Larsen-Freeman and Strom (1977) examined compositions written by 48 ESL students representing five levels of proficiency. The features that made each level unique included clarity, organization, lexical choice, number of T-units, average length of T-units, number of error-free T-units, content, etc. Larsen-Freeman and Strom reported that the total number of error-free T-units per composition was significant, while the increase in T-unit length was statistically nonsignificant across the five groups.

Larsen-Freeman (1978) ambitiously analyzed the compositions of 212 ESL learners at five proficiency levels. Percentage of error-free T-units (the ratio of error-free T-units to all T-units) showed statistical significance among all of the groups. She discovered that although it did not discriminate between adjacent levels, the average number of words per error-free T-unit (the mean length of error-free T-units) also discriminated very well among different levels of proficiency. These findings are the same as those of Vann (1979). T-unit length, on the other hand, did not discriminate very well at the top three levels of proficiency.

Vann (1979) also employed error-free T-units. Vann investigated: 1) the relationship between the oral and written language of 28 adult Arabic-speaking students of ESL and 2) the utility of indices of syntactic maturity as indicators of target language proficiency. The students were designated to "high", "average", or "low" on the basis of holistic evaluations of the samples. The results indicated that mean length of error-free T-units and ratio of error-free T-units to total T-units correlated significantly with TOEFL scores. Vann's study found mean T-unit length did not statistically discriminate between the high and low proficiency groups. The best discriminators were found to be: 1) percentage of mazes, 2) mean error-free T-unit length, and 3) ratio of error-free T-units to total T-units; with the exception of percentage of mazes (fragments), this finding is the same as that of Larsen-Freeman's study (1978). Thus, Vann concluded that "those indices which take errors into account appear to be the best discriminators of language proficiency" (p. 328).

In an earnest search for a second language index of development, Larsen-Freeman (1983) conducted three kinds of ESL studies: (1) the oral data study, (2) the controlled versus the free writing study, and (3) the study of the effect of time on writing. She found that the average number of words per T-unit (mean T-unit length) was statistically significant in (2) and (3). The average number of words per T-unit was also found to produce significant differences among proficiency levels in the study on controlled versus free writing, and that on the effect of time on writing skills. She discovered that the percentage of error-free T-units produced significant differences among proficiency levels,

neither in the controlled writing versus the free writing study, nor in the study on the changes in writing skills over time, though this measure worked well in Larsen-Freeman (1978). As for the average number of words per error-free T-unit, she noted that, though this measure was found to be a powerful measure of L2 proficiency in these three studies, it did not discriminate significantly between all adjacent proficiency levels. Also, the average number of words per error-free T-unit did not sometimes distinguish between proficiency levels with a small number of subjects. Thus, Larsen-Freeman (1983) concluded that this measure, a more powerful measure of L2 proficiency, "is apparently not always sensitive to all individual differences" (p. 300).

Khered (1983) investigated the syntactic development in the free writing samples of EFL Arab students at four proficiency levels to attempt to find measures of language proficiency levels for an EFL index of development. His analysis revealed that the most sensitive discriminators of EFL proficiency levels were the percentage of error-free T-units, the mean number of words in error-free T-units, and the mean number of grammatical errors, suggesting these are real satisfactory measures on which to base an EFL index of development. Interestingly, the mean length of error-free T-units, which the previous researchers (e.g., Larsen-Freeman 1978, 1983) endorsed for an second language index of development, was not considered to be a suitable EFL index of development in Khered's study. His results also revealed T-unit length as the weakest discriminator of proficiency levels of the 12 measures which showed significant differences across levels.

In conclusion, the results from studies on an ESL or EFL index of language development are not consistent with regard to the sensitivity of error-free measures to discriminate between adjacent levels of language proficiency. Further research is needed to develop better measures of language proficiency (Khered 1983).

## **SOME PROBLEMS WITH T-UNIT MEASURES**

In spite of the claims made in the previous literature for the efficacy of the T-unit as an index of syntactic maturity, T-unit analysis has been subject to certain criticisms pertaining to the validity and reliability of T-unit measures, and the way of segmenting T-units.

### **The Validity of T-unit Measures**

Critics question the validity of the T-unit as an index of writing proficiency and overall language development. They argue that T-unit analysis is based on an analysis of syntax alone. First, T-unit measures do not quantify such important factors as organization, cohesion, coherence, relevance in the analysis of syntactic complexity. Second, objective

measures, such as T-unit length and error-free T-unit length, do not consider effectiveness of communication in speech or writing (Ney 1966, Gaies 1980, Perkins 1983).

Gaies (1980 : 56) argues that T-unit analysis fails to evaluate communicative strategies such as circumlocution in assessing an individual's overall language proficiency. Consider the following sentences :

(1) My hobby is collecting hardened parts or prints of animals or plants preserved in rocks. (mean T-unit length=15)

(2) My hobby is collecting fossils. (mean T-unit length=5)

(1) is superficially syntactically more complex than (2). Should (1) therefore reflect a more proficient level in English than (2) ? Or, is the circumlocution of (1) an indicator of restricted lexical ability ?

Ney (1966) and Gaies (1980) argue that T-unit length does not treat excessive coordination within a sentence, although it deals with excessive coordination of sentences (see Ney 1966 and Gaies 1980, for their discussion).

### **The Reliability of Mean T-unit Length**

Individual and group stability of mean T-unit length is an important issue relating to reliability (Witte 1983 : 176). Some researchers (O'Donnell 1976, Witte and Davis 1980, 1982, Witte 1983) have pointed out a troubling issue, an issue regarding the reliability of mean T-unit length as an individual and group trait. Witte and Davis (1980) found that mean T-unit length was a stable individual trait neither within one discourse mode nor across two different discourse modes. That is, the level of syntactic complexity for a particular individual did fluctuate within the descriptive mode and across the descriptive and narrative modes. Witte and Davis (1982), however, found that T-unit length is a stable individual and group trait. Witte (1983) suggests we should investigate at what age and ability level, and in which types of writing samples mean T-unit length may stabilize (p.177). The question of T-unit length stability has not been completely answered.

### **Definition of Error-Free T-units**

Investigators have not agreed on what constitutes an error. Scott and Tucker (1974) judged a T-unit to be error-free if it was correct in all syntax and function words. Vann (1979) counted T-units error-free if they made sense in the given context and did not contain syntactic and lexical errors. On the other hand, some researchers, such as Larsen-Freeman and Strom (1977), Larsen-Freeman (1978, 1983), and Khered (1983), considered a T-unit error-free only if it was perfect in all aspects, including spelling and punctuation. In Ho-Peng (1983), the T-unit was regarded as error-free if it was correct in terms of all

syntax and function words, including spelling and punctuation.

### **T-unit Segmentation and Fragments**

In analyzing the data, the T-unit is not as easily identified as one would expect. It may be a particular problem to segment into T-units or fragments the compositions written by lower-proficiency students because of their ungrammaticality. Fragments or garbles consist of ungrammatical, nonunderstandable sequences of words. Ney (1966) points out the main problem of the punctuation of sentence fragments, and questions: "... if fragments are allowed to stand, do some of them belong to preceding or following T-units or are they separate T-units?" (p. 234)

Opinions regarding how to identify fragments or garbles (Hunt's term) as T-units vary from researcher to researcher. For instance, some researchers may follow a procedure which counts fragments as T-units when only a few words are missing. O'Hare (1973) counted fragments as T-units if one word was missing, as in the sentence "I've met the businessmen succeeded in the big project." In this case, however, the analyst is still faced with another problem with the tabulation of the number of T-units. The problem of which option should be chosen remains. That is, in the case of adding *who* (i.e. "I've met the businessmen who succeeded in the big project."), the result will be one T-unit. Or, if the word *they* is added, as in "I've met the businessmen. They succeeded in the big project", it will be counted as two T-units. Thus, the tabulation of T-units is affected by the method of T-unit segmentation.

### **Limitations of T-unit Analysis**

The mean length of error-free T-units and related measures are not always as sensitive indicators of second language development as we would expect (Gaies 1980, Larsen-Freeman 1983). These measures, which Larsen-Freeman prefers for an ESL index, do not seem to discriminate between adjacent language proficiency levels in all cases, though they discriminate well across proficiency levels.

Gaies (1980) has pointed out another limitation of T-unit analysis. Some researchers (e.g., Larsen-Freeman and Strom 1977, Vann 1979, Gaies 1980) question the use of T-unit analysis for the analyses of data from students of relatively low proficiency because frequent errors cause interference with the understanding of speech and writing samples, and with the calculation of T-units. Gaies (1980) concludes that "T-unit analysis seems to be useful only beyond a certain level of development in the target language" (p. 57).

## SUMMARY AND CONCLUSION

Overall, the literature in ESL and EFL reviewed above indicates that mean T-unit length, the mean length of error-free T-units and the ratio of error-free T-units to total T-units are more valid indices of writing ability and overall language proficiency in L2, though these measures do not discriminate between adjacent levels in all cases. Results from studies of T-unit measures, however, vary with researchers. For example, T-unit length was found to be significant by Cooper (1976), Monroe (1975), Kameen (1979), Flahive and Snow (1980), Ho-Peng (1983), Khered (1983), and Larsen-Freeman (1983); on the other hand most researchers who employed the error-free T-unit (Larsen-Freeman and Strom 1977, Arthur 1979, Vann 1979, Perkins 1980) found the T-unit length statistically nonsignificant. Arthur (1979) found neither T-unit length nor error-free T-unit length significant.

Generally many L2 researchers find the syntactic measures that account for the absence of errors more useful than the T-unit length for assessing ESL or EFL writing ability or for discriminating target language proficiency levels. In sum, T-unit analysis in L2 research claims that learners tend to produce longer error-free T-units and a higher ratio of error-free T-units to total T-units, as they become more proficient in the target language.

As discussed above, however, some researchers have cautioned against the use of the T-unit measures of syntactic maturity when evaluating students' writing or language proficiency. Any overall judgment based on T-unit measures should consider not only the rhetorical effect of students' writing but also variables affecting syntactic complexity such as topics, audience, mode of discourse, ability level, oral/written style. In addition to that, to validate T-unit measures as indices of proficiency, more than a single sample of speech or writing from each subject should be used. Gaies (1980) argues that T-unit analysis "should nonetheless be the object neither of unreasonable expectations nor of exaggerated claims" (p. 59). With these words of caution in mind, one can conclude that T-unit analysis provides us with objective, useful, and easily applicable, if tedious and time-consuming, measures of syntactic complexity, and that T-unit measures can be used as an aid in measuring writing ability and overall language proficiency. More research in EFL as well as ESL should be conducted.

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