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The Effect of Comprehensive Written Corrective Feedback on EFL Learners' Written Syntactic Complexity

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***Background*:** The effectiveness of Corrective feedback has been a controversial issue and thus a central part of second language writing instruction worldwide. It has been argued that the provision of written corrective feedback can affect the complexity of the written text negatively, and the issue is not sufficiently investigated.

***Purpose*:** This study investigated the effects of two types of comprehensive written corrective feedback strategies: direct corrective feedback (DCF), and metalinguistic explanation (ME) on L2 learners' written syntactic complexity.

***Method*:** This study was quasi-experimental and used a pretest-intervention-posttest-delayed-posttest design. Participants were 90 Turkish EFL upper-intermediate learners, whose L2 proficiency and L2 writing skills were controlled by administering the Oxford Placement Test and the IELTS Writing Task 2 test. They were assigned to three groups: DCF, ME, and NF (i.e., no feedback on grammatical errors).The treatment/control period lasted for five weeks. Every week, each participant wrote an essay of argument-led type in class and then received the specified feedback. No work was done on writing for the two-week interval between the posttest and delayed posttest. Lu's (2010) web-based L2 Syntactic Complexity Analyser was utilised to calculate the syntactic complexity measures. The MANOVA test was utilized to find the results.

***Results*:** It was revealed the ME group was not significantly different from the NF group. The DCF group significantly outperformed the ME group in the clauses per sentence (C/S) of the texts both in posttests and delayed-posttests. The DCF group also significantly outperformed the NF group in the clauses per T-unit (C/T), complex T-units per T-unit (CP/T), and C/S in posttests, but the positive effect of the DCF on CP/T was not durable after the two-week interval.

***Keywords*:** comprehensive/unfocused written corrective feedback, direct corrective feedback, metalinguistic explanation, syntactic complexity, EFL learners

Introduction

Corrective feedback (CF) has been a central part of second language (L2) writing instruction worldwide. Nevertheless, the effectiveness of CF has been a controversial issue in the field of second language acquisition (SLA) (Karim & Nassaji, 2020). The debate over the efficacy of written corrective feedback (WCF) dates back to Truscott's (1996) claim that WCF is not only ineffective, but is also harmful to the learners, so it had better be abandoned. One of his reasons was that the provision of WCF can affect the complexity of the written text negatively; in other words, the learners will probably write simplified texts which they are confident they can write accurately (Truscott, 2004, 2007).

Syntactic complexity has been defined as "the sophistication, variety, diversity, or elaborateness of grammatical resources exhibited in language production" (Ortega, 2015, p. 86). From a theoretical perspective, Kellogg's (1990) Overload Hypothesis, Kellogg's (1996) model of working memory, and limited capacity models of attention (Skehan, 1998) support what Truscott (2004, 2007) stated in terms of the probable negative effects of the CF on learners' writing. According to these models, when several processes must be managed simultaneously, as in writing a text (Torrance & Galbraith, 2006), attentional demands are very high, and the learners who are writing can be overloaded and unable to attend adequately (Kellogg, 1988). Additionally, according to Skehan's (1998) limited capacity models

of attention, learners may concentrate their efforts on gaining greater control over items that had already been internalized and are more stable (interlanguage) and avoid expanding their L2 knowledge system (Skehan & Foster, 2001).

Consideration of syntactic complexity is important because many L2 learners, especially those getting prepared for the demands of academic writing, need to improve not only their written accuracy but also the syntactic complexity in L2 writing (Balanga et al., 2016; Brown, 2017). Further, "Language teachers are equally committed to helping their learners develop fluency in their writing and, especially at higher proficiency levels, greater levels of complexity in their writing" (Bitchener & Ferris, 2012, p. 179).

Despite the importance of the issue, to date, few studies have investigated the effect of WCF strategies on developing syntactic complexity in L2 writing (see Chandler, 2003; Fazilatfar, Fallah, Hamavandi, & Rostamian, 2014; Robb, Ross, & Shortreed, 1986; Sheppard, 1992; Valizadeh & Soltanpour, 2021; Van Beuningen, De Jong, & Kuiken, 2012) and these few studies have revealed conflicting results (Bitchener & Ferris, 2012) although studies on the effect of feedback "using measures of accuracy are frequent in the second language writing literature" (Polio & Shea, 2014, p. 10). Consequently, the present research addressed the issue of the effect of comprehensive WCF on the syntactic complexity of the learners' written texts.

Review of Literature

Robb et al. (1986) studied the effect of four types of comprehensive CF (direct correction, the coded feedback, the uncoded feedback, and the marginal feedback) on the complexity of narrative essays written by Japanese college freshmen. The complexity of essays was analysed based on "the ratio of additional clauses to total words written" and "additional clauses" (Robb et al. 1986, p. 90). Although the complexity of essays in all groups improved significantly, there was not any significant difference between the groups. However, as Van Beuningen et al. (2012) found it, Robb et al.'s (1986) study did not include a control group (i.e., no CF), which is a shortcoming.

Then, Sheppard (1992) examined the effects of two types of feedback on essays: "discrete item attention to form and holistic feedback on meaning" (Sheppard 1992, p. 103) with college freshmen from the Caribbean, Latin America, Europe, and Asia. "The ratio of subordinations to the total number of sentences", an indirect measure of complexity, was analysed (Sheppard 1992, p. 106). Sheppard found that discrete item attention to form had a negative effect on the structural complexity, but this finding was not significant. Sheppard's (1992) study had some shortcomings. First, he did not include a no-correction control group. Furthermore, Ferris (2003, 2004) pointed out that there were no inter-rater reliability checks on the coding of the data, making us cautious about accepting the findings.

Afterwards, Chandler (2003) compared the direct and indirect unfocused CF with music majors, from Korea, Japan, China, and Taiwan. The students were required to write about their lives. Chandler concluded that the WCF did not have any effect on the complexity of L2 learners' writing. Nevertheless, Chandler's utilizing holistic ratings was his study's shortcoming (Van Beuningen et al., 2012); the fact that holistic ratings did not show any changes is not necessarily convincing proof "that the linguistic complexity of learners' writing did not change either" (Van Beuningen et al., 2012, p. 9).

Next, Van Beuningen et al., (2012) compared the effect of direct and indirect comprehensive CF on multilingual teenage students' complexity of writing. The participants' L1 included Moroccan Arabic, Turkish, and Surinamese languages and they had limited L2 proficiency. The study was done during biology classes, and the tasks included biology-related topics. As Van Beuningen et al. (2012) explained, to measure structural complexity, they used "a subordination index: the number of subordinate clauses as a percentage of the total number of clauses (i.e., [number of subclauses/total number of clauses]×100). … Lexical diversity was calculated using Guiraud's [1954] Index, a type-token ratio that corrects for text length (types/√tokens)" (Van Beuningen et al., 2012, p. 18). Finally, the researchers reported that both direct and indirect unfocused WCF did not lead to simplified writing. In other words, the error correction did not lead to learners' avoidance of lexically and structurally complex sentences.

More recently, Fazilatfar et al. (2014) investigated whether comprehensive WCF was effective on the syntactic and lexical complexity of Iranian EFL learners' writing at an advanced level. Lu's (2010, 2012) L2 Syntactic and Lexical Complexity Analyser was used to evaluate the complexity of the students' writing. To assess the syntactic complexity, the researchers calculated the mean length of sentence (MLS) and the dependent clauses per clause (DC/C). The study found a significant positive effect on both lexical complexity and the investigated indices of

syntactic complexity on the written texts of the group that had received the comprehensive WCF. It should be noted that only calculating the two indices of length of production at mean length of sentence and the dependent clauses per clause cannot be sufficiently considered as the complex issue of syntactic complexity.

Given the mentioned literature, the results of the studies on the effect of comprehensive WCF on L2 complexity gains are not comparable because of their differences with regard to their treatment period, methodology, measurement instruments, genre of writing task, as well as their participants' conditions (e.g., age, proficiency level, L1 background, L2 learning goals, etc.). Several studies have shown the role of L1 as a moderating variable of L2 syntactic complexity (Jiang, Bi, & Liu, 2019; Khushik & Huhta, 2020; Kuiken & Vedder, 2019; Lu & Ai, 2015; Ortega, 2015; Ströbel, Kerz, & Wiechmann, 2020), the roles of genre/task/content in syntactic complexity in writing, as well as the powerful influence of L2 proficiency, modulating syntactic complexity (Mostafa & Crossley, 2020; Ortega, 2015; Yoon, 2017). Therefore, the effect of WCF strategies on L2 syntactic complexity is a matter which continues to be a subject of controversy and requires more meticulous studies, which do not suffer the mentioned shortcomings.

This Study

Considering the literature, the researcher of this study investigated the effects of WCF on the complexity of the EFL learners' written texts. It should be noted that the researcher attempted to consider and address the methodological limitations which were found in the previously done studies in literature so that the results would be reasonably reliable.

Direct corrective feedback (DCF) and metalinguistic explanation (ME) are two types of explicit correction, which are also two strategies that teachers commonly adopt for correcting linguistic errors in students' written work are (Ellis, 2009). Because of their popularity among L2 teachers, it is critical to investigate whether or not these two commonly utilised types of feedback had any detrimental effects on L2 learners' written syntactic complexity. Consequently, this research looked at the effects of the aforementioned WCF strategies on L2 syntactic complexity with the aim of investigating whether or not the provision of DCF or ME can affect the complexity of the written text negatively because there is obviously a gap between what Truscott (2004, 2007) stated and the supporting evidence.Therefore, in this study, either DCF or ME was provided to the participants. Via DCF, not only the error was underlined but also the corresponding correct L2 form was provided; therefore, learners were explicitly provided with the correct form of their errors. However, using ME, the teacher underlined and numbered the errors in the text and wrote a grammatical description for each numbered error at the bottom of the written text or on a separate paper, attached to the student's written text. In other words, via ME, learners were given some form of explicit comment about the nature of their errors and had to work out the correction from the grammatical description.

Moreover, because this study aimed at investigating the syntactic complexity of the written texts, the comprehensive/unfocused feedback was the most appropriate one as it had also been used in previous studies on the syntactic complexity (Chandler 2003; Fazilatfar et al. 2014; Robb et al. 1986; Sheppard 1992; Van Beuningen et al. 2012). Besides, in focused feedback studies, tasks should be specifically designed to allow the pre-selection of one or two grammatical structures to be focused and to find out whether or not the treatment is effective in correcting these errors (Benson & DeKeyser, 2019; Bitchener, 2008; Bitchener & Knoch, 2008, 2009, 2010; Sheen, Wright, & Moldawa, 2009; Shintani & Ellis, 2013). Natural or free-writing tasks cannot be used for this purpose as was pinpointed by Shintani and Ellis (2015). However, while controlling the task type to ensure that the participants used the focused target structures, exploration of the effect of the treatment on syntactic complexity would not be achieved. Therefore, in the present study, free-writing tasks were used, so that assessing the syntactic complexity of the written texts could be feasible.

As for addressing the methodological limitations found in previous studies, the present one included a control group that did not receive feedback on grammatical errors. Moreover, the inter-rater reliability was checked in this study. Additionally, the moderating variables of proficiency level and L1 background were controlled. Finally, to investigate the effect of the WCF on written syntactic complexity, ten syntactic complexity measures were explored. Hopefully, this study can offer not only theoretical insights into the field but also pedagogical suggestions for teachers on providing feedback and improving English academic writing instruction.

Research Question

The study addressed the following research question:

- What are the relative immediate and delayed effects of the comprehensive DCF, comprehensive ME and NF (no feedback on grammatical errors) on EFL learners' written syntactic complexity measures?

Method

Participants

The participants were selected out of 127 university students whose English proficiency levels were carefully controlled by the administration of the pen-and-paper version of Oxford Placement Test (OPT). A total of 114 students got scores ranging from 40 to 47 out of 60 (i.e., the upper-intermediate level), based on Geranpayeh's (2003). They were selected for the IELTS Writing Task 2 test, which was used to assess the syntactic complexity in the written texts (i.e., to ensure the homogeneity of the students and as the pretest). The students who were homogeneous in their writing ability (90 students) were assigned to three groups, namely DCF (n = 30), ME (n = 30), and NF (n = 30). Unlike the DCF and ME groups that received feedback on their grammatical errors, the NF group was provided with feedback only on content, orthography, and organization, but not on grammatical errors because, as Ferris (2004) stated, it seems almost unethical to single out a group for no feedback.

The 90 participants, aged between 18 to 23, included 50 females and 40 males. All of them had passed the elementary and intermediate writing courses and enrolled in upper-intermediate ones. The participants' native language (L1) was Turkish. The three different groups (DCF, ME, and NF) were in different classes and thus, not in contact with one another during the study.

Given that 127 students had enrolled in university upper-intermediate writing courses, excluding them from the classes was not permitted; as a result, all the learners in classes received the intervention, but for the purpose of the research, the scores (pretest, posttest and delayed-posttest) of the students who were homogeneous in terms of L2 proficiency and L2 writing skills were considered and those who were not homogeneous were discarded from the research although they were present in classes.

Setting and Design

This quasi-experimental research, which utilised a pretest-treatment/control-posttest-delayed posttest design and non-random convenience sampling method, was carried out in real classrooms at a university in Turkey so that the feedback was provided in "the context of an instructional program, with ecologically valid writing tasks", as recommended by Storch (2010, p. 43). Furthermore, following Guénette's (2007) recommendation, the groups in this study had the same teacher; the activities and writing topics were similar as well. This was done to control the possible effects of every other design parameter, except the feedback types.

Variables

The dependent variable is the syntactic complexity measured in the participants' production from the pretests to the posttests and delayed posttests. Syntactic complexity included ten syntactic complexity measures: MLC, MLS, MLT, C/S, C/T, CT/T, DC/C, CP/T, CN/T, and VP/T, which are explained in Table 1 below. The independent variable was the comprehensive WCF type, (DCF and ME, in comparison to no feedback on syntactic errors). Additionally, the participants' English proficiency level and writing ability (i.e., written syntactic complexity) were also the control variables.

Table 1

Ten Syntactic Complexity Measures

Measure	*Code*	*Definition*
Type 1: Length of Production		
1. mean length of clause	MLC	number of words divided by number of clauses
2. mean length of sentence	MLS	number of words divided by number of sentences
3. mean length of T-unit	MLT	number of words divided by number of T-units[1]
Type 2: Sentence Complexity		
4. clauses per sentence	C/S	number of clauses divided by number of sentences
Type 3: Subordination		
5. clauses per T-unit	C/T	number of clauses divided by number of T-units
6. complex T-units per T-unit	CT/T	number of complex T-units divided by number of T-units
7. dependent clauses per clause	DC/C	number of dependent clauses divided by number of clauses
Type 4: Coordination		
8. coordinate phrases per T-unit	CP/T	number of coordinate phrases divided by number of T-units
Type 5: Particular Structures		
9. complex nominals per T-unit	CN/T	number of complex nominals divided by number of T-units
10. verb phrases per T-unit	VP/T	number of verb phrases divided by number of T-units

Instruments

The following instruments were utilised: Oxford Placement Test (OPT), class writing tasks, pretest, posttest, and delayed posttest. For the class writing tasks and tests, samples of IELTS Writing Task 2 were used. Additionally, to calculate the syntactic complexity, Lu's (2010) web-based L2 Syntactic Complexity Analyser was employed.

Oxford Placement Test (OPT)

As Geranpayeh (2003, p. 8) explained, the Oxford Placement Test (OPT) is a flexible test of English language proficiency developed by Oxford University Press and Cambridge ESOL to give teachers a reliable and time-saving method of finding a student's level of English." The validity and reliability of the test have been checked and confirmed through Cambridge ESOL quality control procedures.

Writing Tasks and Tests

All the writing tasks and tests topics were selected from IELTS Writing Task 2 samples in order to (a) consider the criterion-related validity of the test (i.e., the utilised tests and tasks can be comparable to a standardized writing test), and (b) to control for the probable mediating effects of genre/task/content on syntactic complexity in writing. Each class writing task as well as the tests was of argument-led type, which presented an argument to the learners and required the participants to first discuss both for and against views and then finally, to give their own opinions.

Syntactic Complexity Measure

To calculate the syntactic complexity, Lu's (2010) web-based L2 Syntactic Complexity Analyser, entitled, 'Web-based L2SCA: Single Mode' (https://aihaiyang.com/software/l2sca/)was utilised, which was already used by Lu (2011), Fazilatfar et al., (2014), Lu and Ai, (2015), Yang, Lu, and Cushing Weigle (2015). The L2SCA, developed by Professor Xiaofei Lu at The Pennsylvania State University, is a tool that allows language teachers and researchers to analyse the syntactic complexity of written English language texts, using 14 different measures covering (1) length of production units, (2) amounts of coordination, (3) amounts of subordination, (4) degree of phrasal sophistication and overall sentence complexity. This analyser "produces frequency counts of nine linguistic units in the text—word, sentence, clause, dependent clause, T-unit, complex T-unit, coordinate phrase, complex nominal, and verb phrase—and generates 14 indices of syntactic complexity for the text" (Yang, et al 2015, p.58). In the present study, ten out of 14 indices were analysed. Table 1 showed these ten measures.

To assess the syntactic complexity, the automatic approach was used "because it affords speed, flexibility, and reliability" (Crossley & McNamara, 2014, p. 69). Moreover, human raters are likely to be subjective and also they need training, time to score, as well as monitoring, all of which utilize resources (Higgins, Xi, Zechner, & Williamson, 2011).

Data Collection Procedure

The whole research lasted for eight weeks. From week one to week five, every week the participants in each group spent about 50 minutes writing an argumentative essay of minimum 250 words in class and turned it in; the texts which students wrote generally included a range of 250 to 270 words. Then, the teacher-researcher provided the specified feedback to each group. Next, the students were required to revise their corrected text as recommended by Guénette (2012), so they would be responsible for their learning. After receiving five sessions of treatment, on the first session of Week six, the posttest was given. The students could spend maximum 50 minutes writing the test essay. No work on writing was carried out during the sixth and seventh weeks. Then, in the eighth week, the delayed posttest was implemented. No participant took the required tests twice. Further, the essay topics were the same for all three groups

Results

The Normality Tests

The assumption of normality was tested via both the graphic of histogram, and also some numerical ways as recommended by Larson-Hall (2010). The histograms showed that the data were normally distributed. Regarding the numerical methods of assessing normality, the values of skewness and kurtosis statistics were within +/-1, based on Phakiti (2010). Furthermore, the outcomes of the ratio of skewedness and kurtosis over their respective standard errors were within the ranges of +/-1.96, based on Field (2013). Therefore, the numerical tests also revealed that the data were normality distributed.

Ensuring the Homogeneity of the Groups

Grammatical Knowledge

A one-way between-groups ANOVA was run to explore whether the three groups (i.e., DCF, ME, NF) were homogeneous in terms of their grammatical knowledge, as measured by the OPT. No statistically significant difference (at the $p < .05$ level) was revealed in grammatical knowledge scores of the three groups: $F (2, .87) = .03$, $p = .97$.

Syntactic Complexity

To discover whether the three groups were homogenous in terms of the syntactic complexity of their essays, multivariate analyses of variance (MANOVA) were performed because there were several dependent variables (Larson-Hall, 2010; Pallant, 2013; Tabachnick & Fidell, 2013). At the outset, the assumptions of MANOVA (i.e., equal sample sizes, univariate normality, multivariate normality (outliers), multicollinearity and singularity, linearity, and finally, homogeneity of variance matrices) (Pallant, 2013; Tabachnick & Fidell, 2013) were examined. There were no problems with equal sample sizes in each group and the assumption of univariate normality.

To test for multivariate normality, Mahalanobis distance was calculated (Pallant, 2013; Tabachnick & Fidell 2013). The maximum value for Mahalanobis distance for the DCF, ME, and the NF groups were 26.12, 22.31, and 21.50, respectively, which were less than the critical value (i.e., 29.59, based on Pallant, 2013), so it was safely assumed that there were no multivariate outliers.

Next, to check for multicollinearity and check the strength of the correlations among the dependent variables, a correlation test was run (Pallant, 2013; Tabachnick & Fidell, 2013). There were no correlations up around .8 or .9, so there was no reason for concern regarding multicollinearity (Pallant, 2013; Tabachnick & Fidell 2013).

Nevertheless, the correlation coefficient between the CP/T and other indices were mostly below .10, which is considered a very small correlation; therefore, this index could make the data violate the assumption of linearity. Thus, based on Pallant (2013), CP/T was removed from MANOVA and then a separate ANOVA test was performed on it.

Then, to assess the assumption of linearity, a matrix of scatterplots was generated between each pair of variables, separately for each group (DCF, ME, and NF). The scatterplots were roughly oval-shaped (Tabachnick & Fidell 2013) or cigar-shaped (Pallant, 2013), so the assumption of linearity was met.

A one-way between groups multivariate analysis of variance (MANOVA) was performed. Nine dependent variables were used: MLS, MLT, MLC, C/S, VP/T, C/T, DC/C, CT/T, and CN/T. The independent variable was the type of WCF.

Box's test of equality of covariance matrices for pretest of syntactic complexity showed that the assumption of homogeneity of variance-covariance was violated (Sig = .000 < .001), so as recommended by Tabachnick and Fidell (2013), a more stringent alpha level (i.e., .025 for moderate violations), was adopted as the alpha level.

Levene's test of equality of error variances for the indices of syntactic complexity of the pretest revealed that all the Sig. values were over .05, indicating that the assumption of equality of variance for the variables was met.

Multivariate tests for pretest of syntactic complexity indicated that the p-value was larger than the stringent alpha level (.49 > .025), so there was not a significant difference among the three groups on the combined dependent variables, F (18, 158) = .97, p = .49; Wilk's Lambda = .81; partial eta squared = .10. In conclusion, the three groups were homogenous in terms of MLS, MLT, MLC, C/S, VP/T, C/T, DC/C, CT/T, and CN/T of the written essays.

The dependent variable of CP/T had been removed from the data before performing the MANOVA and a separate ANOVA was run on it. It indicated no statistically significant difference in CP/T among the three groups: F (2, 87) = .056, p = .94.

The Immediate Effect of WCF on Syntactic Complexity Measures

A one-way between-groups MANOVA was performed to investigate the differences between groups after the immediate posttest (Larson-Hall, 2010; Pallant, 2013; Tabachnick & Fidell, 2013). Considering the assumptions of MANOVA, no problems were revealed in terms of univariate normality, multivariate normality (multivariate outliers), multicollinearity, and linearity. Nevertheless, the correlation coefficients of C/S and CP/T was mostly small and could make the data violate the assumption of linearity. Thus, based on Pallant (2013), C/S and CP/T were removed from MANOVA and then separate ANOVAs were performed on them.

A MANOVA was performed to investigate the differences in syntactic complexity in three groups of DCF, ME, and NF. Eight dependent variables were used: MLS, MLT, MLC, VP/T, C/T, DC/C, CT/T, and CN/T. The independent variable was the type of WCF.

Box's test of equality of covariance matrices for posttest of syntactic complexity revealed that the assumption of homogeneity of variance-covariance was violated (Sig = .000 < .001), so as recommended by Tabachnick and Fidell (2013), a more stringent alpha level (i.e., .025 for moderate violations), was adopted as the alpha level.

Levene's test of equality of error variances for all the indices of syntactic complexity of the posttest revealed that all the Sig. values were greater than .05, indicating that the assumption of equality of variance for the variables was met.

Multivariate tests for posttest of syntactic complexity indicated that the p-value was less than the stringent alpha level (.024 < .025), so there was a significant difference among the three groups on the combined dependent variables, F (16, 160) = 1.901, p = .024; Wilk's Lambda = .706; partial eta squared = .160. In conclusion, there was a significant difference among the three groups.

Then, to determine how the syntactic complexity indices differed for the WCF, Tests of Between-Subjects Effects table was consulted. Because a number of separate analyses were looked at here, a higher alpha level was set by applying a Bonferroni adjustment to reduce the chance of a Type I error (Pallant, 2013; Tabachnick & Fidell 2013). The original alpha level of .05 was divided by the number of analyses 8 (eight dependent variables). The new alpha level was .006.

Tests of between-subjects effects for posttest of syntactic complexity indicated that C/T recorded a significant value less than .006. (C/T: F (2, 87 = 2.824, p-value = .004 < .006; partial η2 = .118, which is almost a large effect size). Therefore, the three groups (i.e., DCF, ME, and NF) differed in terms of C/T, but to find out which group had higher values, the Tukey's HSD post-hoc test was used (Abbott, 2011). Multiple comparisons for posttest of syntactic complexity for C/T based on Tukey HSD indicated that the mean scores for C/T were statistically significantly different between the DCF and the NF groups (p-value = .004 < .006), but not between the ME and the NF groups (p-value = .549 > .006), or between the DCF and ME groups (p-value = .062 > .006).

As already mentioned, C/S and CP/T were removed from MANOVA test, and two separate ANOVAs were performed on each of them to know whether the three groups were significantly different in terms of these dependent variables.

A statistically significant difference in C/S was found among the three groups: F (2, 87) = 20.33, p = .000. A large effect size was also revealed (η2 = .31), based on Cohen (1988); it shows 31% of the variance in C/S is explained by the treatment.

To discover which group had the higher scores, this significant ANOVA was followed by Tukey's HSD post-hoc tests (Pallant 2013). The new alpha level was .025. Multiple comparisons for posttest of C/S based on Tukey HSD showed that mean scores for C/S were statistically significantly different between the DCF group (M = 2.00, SD = .21) and the ME group (M = 1.76, SD = .26) (p-value = .001 < .025), as well as the DCF and the NF groups (M = 1.61, SD = .23) (p-value = .000 < .025), but not between the ME and the NF groups (p = .037 > .025).

In terms of CP/T, the one-way between-groups ANOVA discovered a statistically significant difference in CP/T among the three groups: F (2, 87) = 5.220, p = .007 < .025. A large effect size was also found (η2 = .10), based on Cohen (1988); it shows 10% of the variance in CP/T is explained by the treatment.

To find which group had the higher scores, this significant ANOVA was followed by Tukey's HSD post-hoc tests (Pallant 2013). The new more stringent alpha level, set by a Bonferroni adjustment is .025. Multiple comparisons for posttest of CP/T based on Tukey HSD showed that mean scores for CP/T were statistically significantly different between the DCF group (M = .54, SD = .12) and the NF group (M = .43, SD = .17) (p-value = .011 < .025), but not between the DCF and ME groups (M = .44, SD = .13) (p-value = .031 > .025), as well as between the ME and NF groups (p = .92 > .025).

The Delayed Effect of WCF on Syntactic Complexity Measures

To discover whether there was any significant difference between the three groups after the delayed posttest, another one-way MANOVA was performed (Larson-Hall, 2010; Pallant, 2013; Tabachnick & Fidell, 2013). Considering the assumptions of MANOVA, no problems were revealed in terms of univariate normality, multivariate normality (multivariate outliers), multicollinearity, and linearity. Nonetheless, the correlation coefficients of C/S and CP/T were mostly small, which could make the data violate the assumption of linearity. Thus, based on Pallant (2013), C/S and CP/T were removed from MANOVA and then separate ANOVAs were performed on them.

A MANOVA was performed to investigate the differences in syntactic complexity in three groups of DCF, ME, and NF after a two-week interval. Eight dependent variables were used: MLS, MLT, MLC, VP/T, C/T, DC/C, CT/T, and CN/T. The independent variable was the type of WCF.

Box's test of equality of covariance matrices for

delayed-posttest of syntactic complexity showed that the assumption of homogeneity of variance-covariance was violated (Sig = .000 < .001), so as recommended by Tabachnick and Fidell (2013), a more stringent alpha level (i.e., .025 for moderate violations), was adopted as the alpha level.

Levene's test of equality of error variances for delayed-posttest of syntactic complexity showed that all the Sig. values of the syntactic complexity indices were greater than .05, indicating that the assumption of equality of variance for the variables was met.

Multivariate tests for delayed-posttest of syntactic complexity indicated that the p-value was less than the stringent alpha level (.002 < .025), so there was a significant difference among the three groups on the combined dependent variables, F (16, 160) = 2.471, p = .002; Wilk's Lambda = .643; partial eta squared = .198. This represents 19.8% of the variance in groups explained by the treatment.

To determine how syntactic complexity indices differed for the WCF, Tests of Between-Subjects Effects table was consulted. By applying the Bonferroni adjustment, the new alpha level was .006 (Pallant, 2013; Tabachnick & Fidell 2013).

Tests of between-subjects effects for delayed-posttest of syntactic complexity indicated that only C/T recorded a significant value less than .006. (C/T: F (2, 87 = 2.728, p-value = .005 < .006; partial η2 = .116, which represents 11.6% of the variance in C/T is explained by the treatment. It was found that the three groups (i.e., DCF, ME, and NF) differed in terms of C/T, but to find out which group had higher values, the Tukey's HSD post-hoc test was used (Abbott 2011). Multiple comparisons for delayed-posttest of syntactic complexity for C/T based on Tukey HSD indicated that the mean scores of C/T were statistically significantly different between the DCF and the NF groups (p-value = .004 < .006), but not between the ME and the NF groups (p- value = .542 > .006), or between the DCF and ME groups (p-value = .068 > .006).

C/S and CP/T had been removed from MANOVA test, and separate ANOVAs were performed on each of them to discover whether the three groups were significantly different in terms of these dependent variables.

In terms of C/S, as measured by the delayed-posttest, a statistically significant difference was found among the three groups: F (2, 87) = 20.977, p = .000 (η2 = .32), which is a large effect size based on Cohen (1988); it shows 32% of the variance in C/S is explained by the treatment. To understand which group had the higher scores, this significant ANOVA was followed by Tukey's HSD post-hoc tests (Pallant, 2013). The more stringent alpha value by using a Bonferroni adjustment was .025. Multiple comparisons for delayed-posttest of C/S based on Tukey HSD showed that mean scores for C/S were statistically significantly different between the DCF group (M = 2.00, SD = .20) and the ME group (M = 1.76, SD = .27) (p-value = .000 < .025), as well as the DCF and the NF groups (M = 1.61, SD = .20) (p-value = .000 < .025), but not between the ME and the NF groups (p = .040 > .025).

Another one-way between-groups ANOVA was conducted to explore whether the three groups (i.e., DCF, ME, NF) were significantly different after the delayed posttest in terms of CP/T as measured by the delayed posttest. Levene's test for homogeneity of variances for delayed posttest of CP/T indicated that the assumption of homogeneity of variance was violated (Sig. = .017); thus, Robust Tests of Equality of Means were consulted (Pallant, 2013). Table 2 shows the results.

As Table 2 reveals, there was not a significant difference between the three groups in terms of CP/T.

Discussion

This study investigated the immediate and delayed effects of two types of comprehensive WCF strategies: DCF and ME on L2 learners' written syntactic complexity. It was revealed that the DCF group outperformed the NF group in the C/T, CP/T, and C/S of the texts. The DCF group also outperformed the ME group in the C/S of the text. The ME group was not significantly different from the NF group. After the

Table 2

Robust Tests of Equality of Means for Delayed-Posttest of CP/T

	Statistic[a]	*df1*	*df2*	*Sig.*
Welch	.868	2	56.058	.425
Brown-Forsythe	.829	2	72.264	.441

a. Asymptotically F distributed.

two-week interval, the results of the delayed-posttest indicated the DCF group still outperformed the NF group in terms of the C/T and C/S. The DCF group also outperformed the ME group in C/S, but the positive effect of the DCF on CP/T was not durable over a two-week period.

Because the previous studies in the literature differed from the present study in terms of their treatment period, methodology, measurement instruments, genre of writing task, as well as their participants' conditions (e.g., age, proficiency level, L1 background, L2 learning goals, etc.), which could all be moderating variables of L2 syntactic complexity, it is difficult to explain the current results by referring to the previous research. In spite of this, unlike Sheppard (1992), the present study found some positive promising effects on the syntactic complexity of the written text, which supports what Robb et al., (1986) found. Moreover, Chandler (2003), using holistic ratings, found no effect on the complexity of L2 students' writing. It can be stated that the findings of the present study can be opposite in some ways and similar in some other ways to Chandler's (2003) result.The findings are different because this study found positive results in terms of the C/T and C/S of the texts; on the other hand, the results are in line with Chandler's because the present study did not indicate any significant differences in terms of other syntactic complexity indices. Van Beuningen et al. (2012) reported that both direct and indirect unfocused WCF did not lead to simplified writing. Based on the mentioned results of the current study, the findings corroborate Van Beuningen et al.'s (2012) report that the comprehensive WCF did not lead to learners' avoidance of structurally complex sentences. Finally, more recently, Fazilatfar et al. (2014) found that unfocused WCF had a positive effect on the length of production at MLS, and a dependent clause ratio (DC/C). In contrast, the present study did not find any significant effect on the MLS and DC/C of the written texts.

In addition to the above-mentioned issues, this study, like Robb et al. (1986), Van Beuningen et al. (2012), and Fazilatfar et al. (2014), does not corroborate Truscott's (2004, 2007) speculation that if learners were faced with CF, they would be more likely to avoid using complex structures. Neither of the treatments made the learners write simpler texts and the DCF even improved the two measures of C/S and C/T. Therefore, the findings of this study also do not conform to Skehan's (1998) limited capacity models of attention, Kellogg's (1990) Overload Hypothesis, and Kellogg's (1996) model of working memory with which Truscott's (2004, 2007) claim is consistent. Nevertheless, it should be pointed out that his study did not meticulously explore the grammatical structures the participants used in their pre-, post-, and delayed posttests to find the signs of avoidance, which is one of the limitations of the study. Therefore, there is no denying that if such a meticulous investigation had been done, some signs of avoidance might have been found.

The positive points found in this study, which was only for the DCF, can be supported by McLaughlin's (1990) information processing model and Anderson's (1993) ACT (Adaptive Control of Thought) model. As Bitchener and Ferris (2012, p. 13) stated, the models explain that intentional learning, for instance, via explicit instruction and corrective feedback can play an important "role in the controlled phase and through 'practice' or 'repeated activation,' language over time becomes automatized." However, as Pienemann explained in his teachability hypothesis and processability theory (PT) (Pienemann, 1987, 1989, 1998), "information processing is unlikely to occur if the targeted linguistic forms and structures lie outside a learner's stage of 'readiness'" (Bitchener & Ferris, 2012, p. 15). The participants in this study were at an upper-intermediate proficiency level; thus, it can be stated that corrective feedback could help them strengthen their previous knowledge. Their declarative knowledge might also have become automatized.

Long's (1996) Interaction Hypothesis and focus-on-form approach (Long, 1996; Long & Robinson, 1998) as well as socio-cultural theory of human mental processing, based on Vygotsky's (1978) socio-cultural theory, also support the results of the current research. The interaction approach also suggests that learning occurs when the learner is exposed to language, produces language, and receives feedback on that production (Bitchener & Ferris, 2012; Gass & Mackey, 2015). Being one of the identified pedagogical focus-on-form instruments, error correction (Ellis, 2005) — WCF in this study, was likely to have contributed to the development of L2 syntactic complexity in this study. Additionally, the socio-cultural theory of human mental processing, based on Vygotsky's socio-cultural theory, assumes that language development, as an example of cognitive development, occurs via social interactions; therefore, when learners collaborate and interact with more advanced or more knowledgeable people, say teachers, their language abilities develop (Bitchener & Ferris 2012). Therefore, various strategies including the CF utilised by teachers can help learners develop their L2 (Lantolf & Thorne, 2007).

Finally, the results of this study are consistent with Schmidt's Noticing Hypothesis (Schmidt, 1990, 2001).

When WCF is provided, learners have enough time – and therefore cognitive resources – to compare their output with the received CF, raising the likelihood of learners noticing the gaps in their interlanguage (Polio, Fleck, & Leder, 1998; Sheen, 2010). Therefore, conscious attention to linguistic form, caused by the CF, could make learners notice the gaps between their own interlanguage output and the target language input provided via feedback (Hulstijn & Schmidt, 1994). Moreover, it could cause the learners' interlanguage grammar to be restructured and developed (Gass, 1997; Long, 2006). More recently, (Ögeyik, 2018, p. 337) acknowledged that "noticing through output-oriented tasks [such as writing and CF] generates a higher level of perception of L2 knowledge".

Conclusion

To sum up, the current study has made a contribution to the question of whether unfocused WCF can facilitate the development of written syntactic complexity. Therefore, L2 writing teachers can provide learners with WCF without major worries about its detrimental effect on the development of syntactic complexity in their writing. This study also demonstrated that the DCF had significant positive effects on the C/T, CP/T, and C/S of the texts. It was even significantly better than the ME in terms of the C/S of the text. Despite these results, there is no denying that replications or more similar studies are needed before firm conclusions can be reached and doubts about the role of comprehensive WCF in the improvement of syntactic complexity can be resolved.

Following the findings of this research, several suggestions can be made for further investigation:

(1) The length of the course may be critical in gaining results; thus, an approximate replication of this study can be conducted through a longer course of instruction using a longitudinal design.

(2) It is suggested that future research explores the various types of grammatical structures the participants utilise in their post- and delayed-posttests to find the probable signs of avoidance.

(3) This study can be replicated with a larger number of participants at different language proficiency levels to compare the results across these levels. Moreover, in this study, only the argument-led essay type was investigated; this type of essay can be compared with another type in another research.

(4) Future research which addresses questions and employs designs similar to the present study, can consider and control for the social, contextual, and individual differences, such as motivation, learning style, and metalinguistic background knowledge.

(5) Finally, think-aloud protocols can be collected from the participants in the two experimental groups (i.e., DCF and ME) while both revising texts and composing new texts in order to provide information on how learners process WCF and how learning takes place.

Declaration of Competing Interest

None declared.

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