

# Effect of Computer-Mediated vs. Face-to-Face Peer Feedback on L2 Introverted vs. Extroverted Learners' Writing Ability and Language-Related Episodes

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## Abstract

This study investigated the effect of face-to-face and computer-mediated peer feedback on L2 introverted and extroverted learners' writing ability and language-related episodes. Eighty-six L2 intermediate English language learners were randomly assigned to two different treatment groups: computer-mediated and face-to-face peer feedback. In computer-mediated classes, the participants exchanged peer feedback and discussed comments using Google Docs platform. Meanwhile, in the face-to-face group, the participants exchanged comments on paper; they also gathered once a week to discuss comments face-to-face. The results revealed that the introverts in the computer-mediated group improved more significantly than the introverts in the face-to-face group. However, the extroverts of both face-to-face and computer-mediated groups improved equally. The findings also indicated that both introverts and extroverts in the computer-mediated group produced more language-related episodes than their counterparts in face-to-face group. Further, the pairing patterns of introverted and extroverted learners were found to have effects on the number of language-related episodes generated by them.

**Keywords:** computer-mediated peer feedback, language-related episodes, introversion, extroversion, L2 writing

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## Introduction

L2 (referring to both second and foreign language) learners' difficulty in writing is well-documented in the literature (Hoomanfar & Meshkat, 2015; Hyland & Hyland, 2019; Teng, 2019; Teng & Zhang, 2020). This difficulty necessitates the employment of different scaffolding tools to assist learners reach the intended writing ability (Rosalina, 2010). One of these scaffolding tools, which has widely been employed in L2 writing classes, is peer feedback. A large volume of research on feedback has shown that peer feedback significantly contributes to improving L2 learners' writing (Chen, 2016; Storch, 2019; Yu & Hu, 2017; Yu & Lee, 2016). However, differential writing improvement of L2 learners with the same writing ability level within peer feedback-powered classes seems to imply this fact that other factors, rather than provided instruction plus peer feedback, might influence the process and product of their learning. Two influential factors are textual and learners' individual differences. Prior studies (Ellis, 2010; Ferris, 2010; Rahimi, 2015) highlighted the significance of these factors and declared feedback research to be incomplete without considering these variables as they can influence the effect of feedback-powered instruction.

One of the individual differences variables, mentioned in several personality models, is learners' introversion/extroversion level. This variable is relevant to peer feedback since prior studies (see below) have shown that learners' introversion/extroversion level can affect their active participation in group work activities, which can result in differential learning outcomes. As a result, the efficacy of peer feedback, as a kind of group work, can be influenced by the extent to which different participants engage actively in both providing feedback and discussing them in follow-up discussions.

The current study addresses this issue by investigating the effect of face-to-face and computer-mediated peer feedback on introverted and extroverted L2 learners' number of Language-related Episodes (LREs) in feedback exchange discussions and writing improvement.

## Literature Review

### *Theoretical Underpinnings*

The theoretical framework of this study is based on mediational artifacts (e.g. computers) as well as learners' individual differences, which are the two main factors that shape the learning process and product (Kormos, 2012). Following the tenets of sociocultural theory, the context of learning is always mediated by different symbolic, cultural, and physical mediational tools that can transform human activities (Erben et al., 2009). These mediational tools are social facilitators that make the traverse between the social plane to the psychological level possible (Vygotsky, 1978). Human cognition, as a social product, is affected by mediational tools through which an individual moves from other-regulation toward self-regulation. Another offspring of sociocultural theory is the concept of languaging (Swain & Lapkin, 2000), referring to learners' use of language as a mediator to objectify their knowledge, which can be assessed, negated and added, or modified. Languaging is an integral aspect of human's thinking, meaning-making self and the basis of his higher mental processes such as consciousness or rehearsing information to be learnt (Swain

et al., 2015). To analyze learners' engagement in languaging, language-related episode (LRE) has been suggested as the unit of analysis. LRE is defined by Swain and Lapkin (2000) as "any part of a dialogue where the students talk about the language they are producing, question their language use or correct themselves and others" (p. 263), and consequently, help them improve their language ability. In the present study, the effect of peer feedback conditions (face-to-face vs. computer-mediated) on the number of LREs generated by introverted and extroverted learners is examined.

Learners' acquisition of a specific item or ultimate success is reported to be highly affected by their individual differences (Dörnyei, 2005; Manchon, 2011). Foreign/second language learners encounter the learning situation with a social, cognitive, linguistic, and affective background. These factors can determine the success or failure of a learning endeavor since they function as mediators between the cause (input) and the effect (the extension in the interlanguage) (Skehan, 1998). The role of individual differences in L2 language learners' achievement has been investigated in the realm of speaking and reading; however, little attention has been paid to the writing skill (Kormos, 2012). In the same vein, within L2 feedback literature, Ellis (2010) has highlighted the significant effects of contextual factors (e.g., the context of learning) and individual difference factors (cognitive and affective factors) on learners' engagement with feedback activity and their uptake level.

Based on these theoretical considerations, this study investigates how computer-mediated environment (artifact mediator) as well as a learners' individual factor (introversion/extroversion, here) contribute to the efficacy of peer feedback (social mediator) in improving EFL learners' engagement with feedback (through generating LREs) and writing improvement.

### ***Computer-Mediated Peer Feedback***

Like other areas in education, in line with the boom in technology in the last two decades, L2 writing classes have benefited from computerized technologies. The employment of computers as mediating tools to exchange comments between students has become a common practice throughout the globe. As Wu (2005) states, the advent of computer-mediated communication in writing classes can noticeably facilitate the process of exchanging different drafts and comments in no time. Tuzi (2004) enumerated time independency, place independency, the absence of pressure to quickly respond as some advantages of computer-mediated peer feedback. The decrease in the authority of teachers in a network-based writing environment can also lead to the empowerment of students. This empowerment makes writers more creative and autonomous (Cooper & Selfe, 1990). Ware and Warschauer (2006) have also encouraged the use of computer mediated peer feedback because of its benefits such as students' facilitated access to texts and comments, fostered sense of community, improved linguistic literacy, and escalated motivation and participation. Other benefits of computer-mediated peer feedback documented in the literature are improved teachers' monitoring (Kamhi-Stein, 2000), better interaction context for students of those countries in which reticence is admired (Lie & Hansen, 2018), decreased apprehension of second language use (Pellettieri, 2000), increased sociolinguistic proficiency (Belz & Kinginger,

2003), perceived sense of community and audience (Ware, 2004), and students' increased level of comprehension and accuracy of comments (Hoomanfarid & Rahimi, 2020). Furthermore, several studies have shown the positive effect of computer-mediated peer feedback on students' writing ability (e.g., Abuseileek & Abualshar, 2014; Song & Usaha, 2009; Storch, 2017).

### ***Individual Differences and Written Corrective Feedback***

While several scholars (Bitchener, 2017; Ellis, 2010; Ferris, 2010; Kormos, 2012; Rahimi, 2015) have underlined the role of individual differences in the success of written corrective feedback, a few studies, reviewed here, have addressed this issue.

The investigation on individual differences affecting the efficiency of feedback is highly limited. Putting perception studies aside, which make up a noticeable part of second and foreign language writing literature, the paucity of studies on individual differences and feedback is easy to notice. Sheen (2007), for example, has investigated the extent to which language aptitude could affect language learners' uptake of corrective feedback. The findings of her study revealed that those with a higher level of analytic ability benefited from corrective feedback. Sheen also reported that L2 learners' analytic ability and aptitude had significant effects on written feedback. In another study, Sachs and Polio (2007) found that the accuracy of students' subsequent revisions was highly correlated with the students' noticing the comments. In 2010, Storch and Wigglesworth found that L2 learners' goals affected their uptake. Similarly, Hyland (2011) found that students' level of engagement with the provided corrective feedback was a function of their learning goal. Hyland (2011) also found that those with higher levels of motivation were more successful in improving the accuracy of their writing. In another study, Rahimi (2015) examined the extent to which students' field dependency and writing motivation could predict their uptake of corrective comments. The findings of his enquiry indicated that field independent students retrieved comments in the short and long run; however, writing motivation could affect the short-term item retrieval.

### ***Extroversion/Introversion Factor, L2 Writing, Corrective Feedback***

Extroversion/introversion, a concept conceptualized in the 1960s, has remained a popular factor in the realm of psychology. These labels are associated with a set of qualities. For instance, extroversion is characterized with sociability, warmth, gregariousness, assertiveness, and passion (Dörnyei, 2005); extroverts also welcome interactions and take conversational risk (Brown, 2000). However, introverts are usually quiet, reserved, and withdrawn (Dörnyei, 2005); they usually prefer not to participate in conversations and are self-sufficient (Wakamoto, 2009). Similarly, Richards and Schmidt (2010) consider extroverts as those who are after social contacts and introverts as those who prefer solidarity. Learners' personalities are believed to influence their information achievement. Extroversion-introversion is one of these characteristics that are believed to affect learners' achievement (Murray & Mount, 1996).

A few studies have investigated the relationship between students'

introversion/ extroversion tendency and their writing achievement. The findings showed two main categories. Some studies (Jafarpour et al., 2015; Layeghi, 2011; Qanwal & Ghani, 2019) found that introverts were more successful writers than their extroverted counterparts. However, some others (Alavinia & Hassanlou, 2014; Nejad et al., 2012) found no significant relationship between students' writing achievement and their introversion/extroversion personality type.

To the best of the researchers' knowledge, the only study examining the role of extroversion/introversion on L2 students' oral feedback engagement was conducted by Matsidi (2019) who examined the effect of oral feedback on students' attitudes toward different feedback types. She found that both introverts and extroverts reported receiving feedback satisfying. She also reported that extroverted and highly introverted learners expressed their positive attitude toward recast feedback.

### ***Extroversion/Introversion Factor, Group Work, Online Environment***

Armchair conceptualizations and empirical studies have provided information on the way students' extroversion/introversion tendencies can affect their satisfaction with and success in group work. Here is a brief review of the most recurrent propositions on this issue. A significant factor that can determine the success of cooperative learning is the extent to which different interactants participate in a task (Johnson et al., 1998). However, some individual differences/features can affect the quantity and quality of students' participation. Hancock (2004), for instance, named students' level of extroversion as one of the characteristics determining the success of group work. Juxtaposing the necessities of success in face-to-face cooperative learning activities and the characterizing features of introverts, one can easily notice that they are at odds. This can make expecting introverted students to benefit fully from these activities to be far-fetched, if not impossible.

To solve this problem, some scholars have resorted to online communication and have examined the performance of introverted and extroverted learners in computer-mediated conditions. Palloff and Pratt (2001), for instance, found that online media benefited those who required time to reflect before saying or doing anything. They found that introverted students benefited from online media since they participated more actively in activities. Several prior studies (Amichai-Hamburger et al., 2002; Daughenbaugh et al., 2002; Harrington & Loffredo, 2010) have indicated that while introverts preferred online courses, extroverts showed their inclination to take on campus courses. Downing and Chim (2004), too, argued that the online medium gave introverted students the chance to function as reflector interactants who can act like an extrovert in the real world. Voorn and Kommers (2013) found that introverted students preferred online media in their learning situations; they found computer-mediated communication a good means to improve their self-confidence and learning performance.

### **The Present Study**

As this brief literature review indicates, no prior study has investigated the effect of face-to-face and computer-mediated peer feedback on L2

introverted and extroverted learners' number of LREs and writing ability. To the best of the researchers' knowledge and as stated by Tigchelaar and Polio (2017) and Teng (2019), the study of the effect of several peer feedback conditions on LREs has remained underexplored. In addition to these gaps, the significance of the role of individual factors in the success of feedback practice, highlighted by key figures in feedback studies (Bitchener, 2017; Ellis, 2012; Ferris, 2010; Hyland & Hyland, 2019; Storch, 2018), and the need for further research investigating the effect of different computer-mediated tools "on the nature of the feedback provided, on how learners engage with that feedback, and ultimately on L2 learning outcomes" (Storch, 2018, p. 270) motivated the researchers to conduct this study. This study was designed to answer the following research questions:

**Research question one:** Do face-to-face and computer-mediated peer feedback conditions have the same effect on L2 introverted and extroverted learners' writing accuracy?

**Research question two:** Do face-to-face and computer-mediated peer feedback conditions result in equal number of LREs generated by L2 introverted and extroverted learners?

## **Method**

### ***Participants***

Eighty-six foreign EFL learners, both males (N = 41) and females (N = 45) at an intermediate level of English language ability participating in an IELTS writing preparation course, took part in the present study. They ranged from 18 to 25 years of age. These participants had enrolled in six intact classes. Three classes were randomly assigned to computer-mediated peer feedback treatment and three to face-to-face peer feedback treatment. In order to check the homogeneity of the participants with regard to their writing ability, they were given an argumentative prompt selected from the writing section (task 2) of an IELTS practice test. The acquired mean score was 6.2, with a standard deviation of 0.8. The scores of the participants fell within  $\pm$  one standard deviation from the mean score. These participants had passed three courses covering four skills prep content. In all prior courses, they had only received teacher feedback on their texts.

We also administered two questionnaires to identify introverted and extroverted students. We employed two measures to minimize the chances of wrong categorization. The findings of the two questionnaires showed that six participants were categorized differently by the questionnaires, so they were excluded from the study. Based on the results, out of 42 students in the online group, 22 (52.4%) were introverts and 20 students (47.6%) were extroverts and in the face-to-face group, 23 students were introverts (54.03%) and 21 extroverts (45.8 %).

### ***Materials and Instruments***

**Google Docs.** Google Docs is a user-friendly word processor provided by Google Company. This program is similar to Microsoft Word and several users can modify a text either simultaneously or at different times. The users can either key directly in their text or paste a text already written in another

word processor. The texts written in Google Docs are stored in Google Drive and all revisions can be tracked to identify the editor and the edition time. The users can correct items, provide marginal comments, and respond to comments easily. A video clip showing different features of this program was played back in the first session to make sure all participants can work with it smoothly.

**Writing Tasks and Rating Scale.** Two argumentative tasks were employed to examine the participants' writing ability at the beginning and the end of the study. The participants were asked to write at least 250 words in 40 minutes. The topics were:

Pre-test task: Does the use of computer/technology in class benefit the educational process?

Post-test task: Should students be allowed to use computers and tablets in classes?

In order to score the participants' texts, an analytic rating scale developed by Jacobs et al. (1981) was employed. This scale includes 5 dimensions which are content, organization, vocabulary, language use, and mechanics. In order to ensure the consistency of the scoring process, half of the papers were rated by another rater who was familiar with the scale and the inter-rater reliability value of .86 was achieved.

**Introversion/Extroversion Questionnaires.** The researchers employed Eysenck Personality Questionnaire (Eysenck et al., 1985) and the Sixteen Personality Factor Questionnaire (Cattell, 2001) to categorize their participants into two groups of introverts and extroverts. Two measures were employed to increase the construct validity of the whole measurement process (Johnson et al., 2000).

The extended version of Eysenck Personality Questionnaire includes 100 yes-no questions, 23 of which are related to extroversion/introversion. To ensure the integrity, validity, and reliability of the measure, the participants answered all items, but just these 23 items were analyzed. The reliability of the whole measure in this administration was .84 and that of the extraversion subcomponent was .78. Since the personality style (extrovert/introvert), as shown by the questionnaire, is a matter of degree rather than type, it is evaluated by the score that the respondent receives on the questionnaire. In other words, the higher the score, the more extrovert the respondent is. Based on the questionnaire manual, to categorize the learners into extroverted and introverted groups, they were arranged based on the scores they received from the highest to the lowest scores. Then the high and the low 40% were considered extrovert and introverts, respectively. Twenty percent of the participants with the closest scores to the mean score were excluded to minimize the occurrence of mis-categorization of the participants.

The second measure employed was the Sixteen Personality Factor Questionnaire, which is a well-known measure with acceptable evidence of construct validity in different contexts (Cattell, 2001). It is a forced choice seven-point bipolar scale and examines 16 different traits, one of which is extraversion. This trait is assessed using five primary scales and 14 items. The reliability of the whole measure in this administration was .87 and that of the extraversion subcomponent was .81. The scoring procedure of this measure automatically categorized the participants into two groups of introverts and extroverts.

### ***Class Procedure***

The data were collected between October and December, 2019. Both groups were given a 30-minute peer feedback workshop by a TEFL PhD candidate, and different features of high-quality peer feedback were reviewed. Those in the face-to-face group exchanged peer feedback on paper, but those in the online group used the online platform to exchange the comments.

The students in the online group had three days to write and upload the first version, then they had one day to read their peers' papers and exchange comments through the website. Afterwards, they had three days to upload the second version of the assignment and applied the comments. This procedure continued during the whole semester. The nature of communication within the employed platform was asynchronous; however, with a fifteen-second delay (varying based on the Internet speed), the students could discuss with each other. It was their own choice to respond immediately or discuss the feedback provider with a delay. All comments and versions could be stored within the online platform.

Just like computer-mediated group, the students in the face-to-face group had three days to write their first draft and attend the feedback discussion session. In the face-to-face group, in addition to the usual class session, which was similar to that of the online group, the participants met an extra 45-minute session a week. This extra session was planned as an attempt to assimilate the interactive nature of computer-mediate peer feedback activity, where the participants gathered to discuss the provided comments. They, then, had four days to revise their texts and submit both their first and revised versions to the teacher in the upcoming session. The students were asked to keep a copy of both versions of their texts (and their peers' comments) and submit a portfolio at the end of the semester.

In both online and face-to-face groups, the students were paired purposefully by the instructor so that they could work with different introverted and extroverted students. It should be noted that each student gave and received feedback to and from a different classmate on each text. In both treatments, the main language used in follow-up discussions was English; however, a few sentences in Persian were tolerated. The instructor was an in-the-background facilitator. Totally, the students were required to write ten papers in ten weeks. The topics on which students had to write were basically expository and argumentative (the two genres normally used in IELTS). The word count of their essays had to be no less than 250 words (the minimum length in the IELTS writing test). It should be noted that all students had a very short experience of computer-mediated communication and were familiar with the platform. The writing loop was closed in a week in the majority of cases (96%); however, in a few cases, the students went on exchanging comments and submitted their texts after the deadline

### ***Data Collection and Analysis***

The independent variables of this study were peer feedback condition with the two levels of face-to-face and computer-mediated and the dependent variables were L2 students' writing ability and generated LREs. In this study, a 2x2 between-within RM ANOVA and a series of independent-samples t-tests



were run to answer the research questions.

In order to answer the first research question, the extroversion-introversion questionnaires were given to the participants of the study. The questionnaires and the writing pre-test were administered in the first session of the semester. The treatment took 10 weeks. And in the twelfth week, the writing post-test was given to check the improvement of the writing ability of the participants. The same task was used in both groups. In order to make the pre- and the posttest comparable, they both used argumentative prompts. The writing tasks were scored based on the rating scheme provided by Jacobs et al. (1981).

Another part of this study was the examination of LREs created by students in their peer feedback activities. Language-related episode is considered to be a well-known tool to analyze learner-learner interactions (Ellis, 2012; Scott & Fuente, 2008; Storch, 2007). In order to analyze LREs, the researchers audio-recorded and transcribed the discussions in the fifth and ninth sessions. To have sufficient data to answer the second research question, the researchers decided to record and analyze the data in these two sessions. The sessions at the beginning of the study were not included since the first four sessions focused on familiarizing the students with the online system as well as giving them enough time to get accustomed with the treatments and show unmarked performance. Although the examination of all sessions would have provided more data, due to practicality issues, the researchers decided to record and analyze a sample including the fifth and ninth sessions.

All LREs were identified and tallied to reach the mean scores of LREs created in different discussions and groups (Two LREs taken from the data are provided in the Appendix.

In order to make sure about the coding procedure, an instructor with a PhD in TEFL, who is familiar with the analysis of LREs, reviewed half of the analysis and the reliability index found to be .91. After extensive discussions, the consistency was raised to .96.

## Results

Descriptive statistics for the performances of the four groups (online introverts, online extroverts, face-to-face introverts, and face-to-face extroverts) on the pre- and posttest have been presented in Table 1. The table also presents the results of four paired t-tests run to find out if the differences between the pre- and posttests were significant.

**Table 1**

*T-test Results for the Difference between the Pre-test and Post-test Writing Scores of the Four Groups*

Group	Pre-test		Posttest		t	Sig
	M	SD	M	SD		
Online Introverted	60.22	8.02	70.27	6.74	14.10	0.001
Online Extroverted	59.85	8.08	71.10	7.62	15.51	0.001
Face-to-face Introverted	60.79	9.16	65.25	7.48	7.37	0.001
Face-to-face Extroverted	61.45	6.30	67.15	6.28	9.73	0.001

The results presented in Table 1 show that all the four groups

significantly improved their writing performances at the end of the experiment. Since the feedback targeted both content and form, we also analyzed the students' scores on these two aspects to see if both feedback types have been effective in both online and face-to-face forms. Based on the ESL Composition Profile rubric used to evaluate the students' texts in this study, 50% of a writing score is assigned to content and organization and 50% to vocabulary, language use, and mechanics, which can all be categorized as form. Table 2 illustrates the results. In order to answer the first research question, we first ran a 2x2 between-within RM ANOVA. The results indicated a significant effect for *Time* ( $F = 2.16.64, p = 0.013$ ) and for *Personality Factor* ( $F = 5.77, p = 0.038$ ), but no effect for the class type (face-to-face or online) ( $F = 1.24, p = 3.23$ ). The results also showed no significant effect for the interaction of *Time* and *Personality trait* ( $F=.74, p=7.43$ ) as well as *Time* and *Class type* ( $F = 1.53, p = 3.15$ ).

In order to show where the differences between the four groups lie, a number of follow-up independent t-tests were run. As far as the differences between the writing performances of extroverts and introverts in each mode (online and face-to-face) are concerned, Table 2 indicates that there is no significant difference between the performances of the introverts and extroverts in online group on the pre-test ( $t = 0.15, p = 0.88$ ); similarly, no significant difference is observed between the pre-test scores of introverts and extroverts in the face-to-face group ( $t=0.27, p=0.78$ ).

**Table 2**

*T-test Results for the Difference between the Writing Scores of Introverts and Extroverts in each Group*

Test	Group	Mean	t	Sig.
T1	Online introverted	60.22	0.15	0.88
	Online extroverted	59.85		
T2	Online introverted	70.27	0.37	0.71
	Online extroverted	71.10		
T1	Face-to-face introverted	60.79	0.27	0.78
	Face-to-face extroverted	61.45		
T2	Face-to-face introverted	65.25	2.07	0.04*
	Face-to-face extroverted	67.15		

The posttest results for the online group show that both groups made more or less the same amount of improvement and, hence, no significant difference was observed between these introverts and extroverts ( $t = 0.37, p = 0.71$ ). However, the results of the posttest for the face-to-face group showed that extroverts made more improvement than the introverts ( $t = 2.07, p = 0.04$ ); the Cohen's *d* value was .63 showing a medium to high effect size.

To provide a more precise picture of students' performance on the two writing tasks (pre- and posttest) we calculated their content and form scores separately and ran t-tests between them. Table 3 presents the results.

**Table 3**

*T-Test Results for the Difference between the Pre-test and Post-test Content and Form Scores of the Introverts and Extroverts in Each Group*

Group	M(Pre) Content	M(Post) Content	t	Sig	M(Pre) Form	M(Post) Form	t	Sig
Online Introverted	29.31	34.86	14.16	0.001	30.90	35.40	9.89	0.001
Online Extroverted	30.10	36.45	4.73	0.001	29.75	34.65	8.14	0.001
Face-to-face Introverted	29.79	31.16	16.76	0.001	31.04	34.08	12.15	0.001
Face-to-face Extroverted	30.05	33.05	8.75	0.00	31.40	34.10	9.12	0.001

Table 3 illustrates that, similar to overall writing scores, all the four groups have improved both their content and form scores on the posttest. This is indicative of the fact that peer comments whether online or face-to-face have improved the participants' texts both in terms of language and content.

We also compared the content scores and the form scores of the extroverts and introverts in online and in face-to-face groups. Table 4 illustrates the results.

**Table 4**

*T-test Results for the Difference between the Content and the Form Scores of Introverts and Extroverts in each Group*

Time	Group	Mean Content	t	Sig.	Mean Form	t	Sig
T1	Online Introverted	29.31	0.60	0.54	30.90	0.85	0.39
	Online Extroverted	30.10			29.75		
T2	Online Introverted	34.86	1.36	0.18	35.40	0.60	0.54
	Online Extroverted	36.45			34.65		
T1	Face-to-face Introverted	29.79	0.20	0.83	31.04	0.28	0.78
	Face-to-face Extroverted	30.05			31.40		
T2	Face-to-face Introverted	31.16	2.28	0.03*	34.08	0.63	0.53
	Face-to-face Extroverted	33.05			34.10		

As illustrated in Table 4, none of the differences are significant except for the difference between the posttest content scores of introverts and extroverts in the face-to-face group. That is, peer CF helped the extroverts improve the content and organization of their writing more than the introverts (M= 33.05 for extroverts and M = 31.16 for introverts,  $t = 2.28$ ,  $p = 0.03$ ). We also compared the performance of the introverts and extroverts in face-to-face and online groups. Table 5 presents the results.

**Table 5***T-test Results for the Difference between the Writing Scores of the Four Groups*

Time	Group	Mean	T	Sig.
T1	Online Introverted	60.22	0.22	0.82
	Face-to-face Introverted	60.79		
T2	Online Introverted	70.27	2.38	0.02*
	Face-to-face Introverted	65.25		
T1	Online Extroverted	59.85	0.69	0.49
	Face-to-face Extroverted	61.45		
T2	Online Extroverted	71.10	1.78	0.08*
	Face-to-face Extroverted	67.15		

As Table 5 illustrates, only the difference between the posttest performance of introverts in the face-to-face and online groups is significant ( $t = 2.38, p = 0.02$ ). The results also showed a high effect size ( $d = 0.84$ ) verifying the superiority of the computer-mediated treatment for the introverts. The same groups were compared with respect to their content and form scores. Table 6 illustrates the results.

**Table 6***T-test Results for the Difference between the Form and Content Scores of the Four Groups*

Time	Group	Mean Content	t	Sig.	Mean Form	t	Sig
T1	Online Introverted	29.31	0.34	0.72	30.90	0.10	0.91
	Face-to-face Introverted	29.79			31.04		
T2	Online Introverted	34.86	3.24	0.001*	35.40	1.19	0.23
	Face-to-face Introverted	31.16			34.08		
T1	Online Extroverted	30.10	0.04	0.96	29.75	1.24	0.22
	Face-to-face Extroverted	30.05			31.40		
T2	Online Extroverted	36.45	3.76	0.001*	34.65	0.11	0.90
	Face-to-face Extroverted	33.05			34.10		

The results show that both introverts and extroverts in the online group had significantly higher posttest scores than their counterparts in the face-to-face group ( $t = 3.24, p = 0.001$ , for introverts; and  $t = 3.76, p = 0.001$ , for extroverts).

### **Number of Comments and LREs**

The second section of this study dealt with the analysis of quantity and quality of LREs initiated by learners. This question was raised to have a better understanding of the differences between introverted and extroverted writing scores in computer-mediated and face-to-face conditions. The findings showed that the participants in computer-mediated group provided 1476 comments ( $M = 35.14, SD = 4.53, M_{\text{introvert}} = 26.36, SD = 4.21, \& M_{\text{extrovert}} = 28.1, SD = 4.86$ ) and those in the face-to-face group gave 1105 ( $M = 22.95, SD = 3.65, M_{\text{introvert}} = 22.95, SD = 3.65, \& M_{\text{extrovert}} = 27.2, SD = 3.68$ ) on the two examined texts. The analysis of comments showed that the learners in the computer-mediated group provided 637 content feedback (56.17%) and 497 form (43.82%) comments and those in the face-to-face group gave 568 content feedback

(51.4%) and 537 form (48.60%) feedback. The comparison of these mean scores indicated that the computer-mediated group students provided significantly more comments ( $t = 4.57, p = 0.03$ ), more content feedback ( $t = 5.38, p = .02$ ), and fewer form feedback ( $t = 5.43, p = .02$ ).

The higher posttest scores of the introverts in the online group than those of the introverts in the face-to-face group can be attributed, though partially, to the higher number of comments the students in computer-mediated group. We also calculated the number of LREs of the two groups. Similar to the comments, here, too, both the introverts and the extroverts in the online group had significantly more LREs than their counterparts in the face-to-face groups. Table 7 presents the results.

**Table 7**  
*T-test Results for LREs*

	Mean	SD	t	Sig
Online Introverted	32.18	3.81	5.94	0.001*
Face-to-face Introverted	25.75	3.49		
Online Extrovert	38.4	3.6	2.50	0.017*
Face-to-face Extrovert	34.9	4.98		

As the results show, the number of LREs for online introverts ( $M = 32.18$ ) was significantly higher than that of face-to-face introverts ( $M = 25.75$ ) ( $t = 5.94, p = 0.001$ ); similarly, the number of LREs for the online extroverts ( $M = 38.4$ ) was higher than that of face-to-face extroverts ( $M = 34.9$ ) ( $t = 5.75, p = 0.001$ ). Moreover, the means of content and form LREs were computed (Table 8).

**Table 8**  
*T-test Results for Content and Form LREs*

Group	Mean Content	t	Sig.	Mean Form	t	Sig
Online Introverted	18.81	4.75	0.001*	13.36	1.89	0.07*
Face-to-face Introverted	14.33			11.41		
Online Extrovert	29.8	3.22	0.003*	8.6	.197	0.87
Face-to-face Extrovert	27.9			8.3		

As Table 8 shows, the introverts in computer-mediated group initiated significantly more content ( $t = 4.75, p=001$ ) and form ( $t = 1.89, p = .007$ ) LREs than the introverts in face-to-face group. Regarding the extroverts, those in computer-mediated group started significantly more LREs ( $t = 3.22, p = .003$ ); however, the means of form LREs were not significantly different across the two conditions ( $t = .197, p = .87$ ).

The last set of data examined in this study was the means of LREs produced by different pairs under different conditions (Table 9).

**Table 9***T-test Results for LREs Generated by Different Pairs*

Group	LREs Mean	t	sig
Online Introverted-Introverted	16.14 (SD= 2.4)	2.85	.008*
Face-to-face Introverted-Introverted	13.85 (SD= 1.8)		
Online Extrovert-Extrovert	56.07 (SD=4.75)	5.41	.000*
Face-to-face Extrovert-Extrovert	46.5 (SD= 4.61)		
Online Extrovert-Introverted	33.21 (SD= 2.8)	.04	.067
Face-to-face Extrovert-Introverted	33.71(SD= 3.4)		

As shown in Table 9, the means of LREs produced in different conditions seems to be influenced by the introversion/extroversion profile of the pairs. The findings showed that LRE means of introverted-introverted and extrovert-extrovert pairs in the online group were significantly more than those of these pairs in the face-to-face group ( $t = 2.85$ ,  $t = 5.41$ ,  $p = .008$ ). But the mean of LREs produced by extrovert-introverted pairs were not significantly different in online and face-to-face conditions ( $t = .04$ ,  $p = .067$ ).

### Discussion and Conclusion

Although L2 feedback literature has called for the examination of the role of individual differences in the success of feedback practices (Bitchener, 2017; Ellis, 2010; Ferris, 2010; Kormos, 2012; Rahimi, 2015), several niches have not been occupied yet. The present study addressed the effect of computer-mediated peer feedback on L2 introverted and extroverted learners' writing ability and LREs to fill one of these gaps.

The results of this study showed that computer-mediated peer feedback seemed to benefit both introverted and extroverted learners equally since there was not any significant difference between their posttest mean scores. The results also showed that both introverts and extroverts in computer-mediated groups received significantly higher scores on the content and organization of their writing than their counterparts in the face-to-face group.

One of the reasons that might have benefitted introverts in the computer-mediated condition is the better affective condition, which matches their personality characteristics. Dawley (2007) argues that, in asynchronous computer-mediated learning conditions, where learners are not tightly confined with external forces, introverts interact more freely, engage in different activities, foster their intrinsic motivation. Furthermore, it can also provide a less threatening condition for those who are less competent or less self-confident and enable them to participate more actively in learning activities (Pu, 2020). The higher scores of the computer-mediated group might have developed out of the higher number of enthusiastic follow-up discussions (LREs), which could be integrated into introverted students' cognitive set more easily because of low affective and cognitive pressures.

The findings regarding the first research question were in line with those of Lin and Overbaugh (2009), which asserted the extroverts' advantage over introverts in face-to-face classes where learners are engaged in face-to-face communication with the teacher and other students. Nonetheless, these

results are in contradiction with the ideas of Amichai-Hamburger et al. (2002) and Downing and Chim (2004) who found introverts in an online condition more successful than the extroverts. A likely explanation for the non-significant difference between the two groups can be the presentation of a condition which aligned with the personality characteristics of both groups. The literature has reported the extroverts' satisfactory performance in collaborative learning activities (e.g., DiTiberio, 1996) and the asynchronous nature of the interactions in this study, which has been reported to be the right condition for introverted learners (Amichai-Hamburger et al., 2002; Daughenbaugh et al., 2002; Downing & Chim, 2004; Harrington & Loffredo, 2010; Palloff & Pratt, 2001) have resulted in a synergic condition in which both groups benefited from the activity with no significant difference.

The examination of the quantity and quality of comments and LREs generated by introverted and extroverted learners in different conditions, which was addressed in the second research question, showed that the computer-mediated condition led to significantly more content feedback, and fewer comments on form. The results also indicated that both introverted and extroverted students in the computer-mediated group initiated significantly more LREs than their counterparts in face-to-face groups. Further analysis indicated that, except for the form LREs provided by extroverted learners, the rest of comparisons (content and form LREs by introverts and content LREs by extroverts) showed significant differences, indicating the superiority of computer-mediated condition.

These findings can also explain the higher writing performance of the participants in the computer-mediated group. It seems to be attributable to the higher number of comments and LREs made in the follow-up discussions. Swain (2013) argues that the amount of languaging, through LREs, can determine the success of language learners' improvement as they will have more opportunities to assess and modify their interlanguage through positive and negative evidence. Interestingly, the results of this study showed that, while the numbers of comments and LREs in the face-to-face group were so close, the number of LREs made in the computer-mediated group was noticeably higher than the number of comments. This finding suggests that computer-mediated condition provides the learners with more languaging opportunities than face-to-face interactions.

In addition to the quantity of LREs, the quality of LREs seems to be an effective factor in forming the superiority of the computer-mediated condition. While the participants in the computer-mediated group employed written LREs, those in the face-to-face group made oral LREs. The superiority of the former condition can be due to the mode of these LREs (oral vs. written). Muñoz and Muñoz (2006), in a non-writing context, has found that learners' quality of reasoning is higher when they write their thoughts than when they express them orally. Similarly, Suzuki (2017) found written languaging to be more efficacious in improving L2 learners' writing ability and learners' revisions than oral languaging. He argued that the lower cognitive demand due to the absence of time pressure resulted in higher and deeper interactions. This can also justify the higher number of content LREs in the computer-mediated condition, which can be one of the main reasons for the significantly higher

content scores.

The findings also showed that the participants in the online group provided significantly more LREs. This may explain why both the introverts and the extroverts in the online group received higher posttest scores on the content of their essays than their counterparts in the face-to-face group. Webb (1989) argues that introverted students prefer to work alone, at least with their own principles; however, it seems that, due to the safer and more relaxing internet environment for discussion and asking questions (Caspi et al., 2006), the introverts in computer-mediated group generated more LREs than their counterparts in the face-to-face group. Regarding the extroverts, although extroversion is positively correlated with classroom participation and student-teacher interaction (Furnham & Medhurst, 1995), online courses can be adapted to the needs of extroverts and make them as effective as usual face-to-face classes through forming small group discussions (Offir et al., 2007). The extensive interactions in the form of high number of comments and LREs made by the extroverts in the computer-mediated condition seems to compensate for their penchant for interacting with others.

Finally, the findings indicated that the pairing of the participants based on different introversion/extroversion profiles resulted in significantly different quantities of LREs. In the findings, the lowest amount of languaging belonged to introverted-introverted interactions in face-to-face condition; however, the LRE frequency of the same group in computer-mediated condition was significantly higher. The same pattern was seen for the extroverts, although no significant difference was seen for extrovert-introverted pairs within face-to-face and computer-mediated conditions. These findings suggest that the extroversion/introversion of participating students can determine the number of LREs they generate. While the computer-mediated condition helped introverted-introverted and extroverted-extroverted pairs create more LREs, the LRE means of introverted-extroverted pairs showed that the feedback exchange mode did not significantly affect the amount of their languaging. Nevertheless, the scrutiny of the LREs made in this pair showed the dominance of extroverts in the interactions. The introverts were marginalized in both computer-mediated and face-to-face conditions when they were paired with extroverts. Although the LRE means of the extroverted-introverted pairs in both conditions were higher than those of the introverted-introverted pairs, the majority of these LREs were initiated by the extroverts. In a non-linguistic study, Sohn and Jo (2003) have found that, in group activities, the best pairing strategy is to group learners based on their personality factors; otherwise, the discrepancies between their characteristics are likely to generate difficulties in both learning and task completion. In the case of peer feedback, a problem which can arise is the dominance of the extroverted person over the introverted one, which can result in negative feelings and learning experience.

### **Implications and Further Studies**

Based on the findings of this study, the researchers of this study invite foreign language practitioners to employ computer-mediated peer feedback to enable both their introverted and extroverted learners to engage in more languaging, which has been reported to affect learners' language improvement



(Swain, 2013). The computer-mediated peer feedback seems to create a condition which matches the needs and wants of both introverted and extroverted learners; thus, no one is left behind in this condition. Otherwise, if language teachers stick to face-to-face peer feedback condition, a significant percentage of the learners who are introverted will be deprived of many languaging opportunities. Even though learners' overemphasis on form while providing comments has been reported as one of the drawbacks of peer feedback (Hyland, 2003), the higher number of content comments and LREs within the computer-mediated condition, which seems to be the result of written mode of languaging (Suzuki, 2017), can be another motivation to employ computer-mediated peer feedback design.

In addition, language teachers are recommended to have a profile of their learners' personality, measured simply by questionnaires, and pair their students carefully to maximize the number of LREs in interactions; however, the extroverted-introverted pairs should be kept to a minimum level as the risk of negative feelings and learning experience caused by the subordination of the introverts can have detrimental effects in the short and long run.

Regarding further studies, other researchers may replicate the present research with a more populated sample to confirm or reject the findings of the present study. Moreover, the study can be replicated with the students of a lower proficiency level, to see if they can still produce a higher number of LREs in the online environment and if the EFL learner's feedback at this level is still helpful. Further research can employ genetic analysis to uncover the role of LREs produced in different pairs (introverted-introverted, introverted-extroverted, extroverted-extroverted) in learners' language development.

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## Appendix LREs

### **LRE1: Asking for explanation**

Comment provided by Learner A: "You have used *will* in this sentence but this is not correct."

Learner B: Which part of this sentence is not grammatical?

Learner A: This is a conditional type-two sentence. You should use *would* in the second part.

Learner B: So, it should be *I would buy a luxurious house*. Am I right?

Learner A: That's right.

### **LRE2: Further explanation by feedback provider**

Comment provided by Learner C: "This paragraph is not strong."

Learner D: "What do you mean by it is not strong?"

Learner C: "I meant you should have backed up your main idea more strongly."

Learner D: "OK, but how?"

Learner C: "Give some examples and personal experiences to make it better."

Learner D: "Is really writing about what happened to me in relation to this issue ok?"

Learner C: "Of course! Why not?"

Learner D: "Sure. I will add it. Thanks."