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Enhancing EFL Learning Through Concordancing: A Quasi-Experimental Study on EFL Learners' Collocational Competence and Retention, Motivation, and Autonomy

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ABSTRACT

Objective: Enhancing collocational competence, alongside improving learner motivation and autonomy, is a cornerstone of effective EFL instruction. Despite the well-documented affordances of corpus-based tools, particularly concordancers, in supporting various aspects of language development, their integration into mainstream language pedagogy is surprisingly limited. In response to this pedagogical oversight, the present study explores the efficacy of the concordancing software AntConc in advancing Iranian EFL learners' development of collocations, long-term retention, self-directed learning, and motivational engagement.

Methods: Sixty intermediate-level learners were employed and then assigned to either a control or experimental group. Over a five-week intervention, participants in the experimental group engaged in practical corpus analysis using AntConc, working directly with authentic English language data. In contrast, the control group followed a traditional, teacher-centered instructional model. To capture the intervention's impact, the study employed a combination of pre-tests, post-tests, delayed post-tests, and self-report questionnaires.

Results: The findings revealed significant developments in all measured domains for the experimental group, as confirmed by t-tests, mixed-design ANOVA, and Mann–Whitney U tests.

Conclusion: The findings indicated that the use of concordancing was more effective than conventional approaches in enhancing learners' knowledge and long-term recall of collocations. Furthermore, it contributed to increased motivation and autonomy by fostering a more engaged, discovery-oriented approach to learning.

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1. Introduction

In English as a Foreign Language (EFL) field, building a robust vocabulary base is essential for effective language learning, where lexical competence highly impacts communicative competence. Vocabulary learning extends beyond the mere memorization of word meanings. It demands a grasp of how words function together in authentic contexts. Collocational competence, the ability to recognize and produce frequent and conventional word pairings, is one the most demanding facets of vocabulary development. Collocations, often resistant to direct translation from students' first languages (L1), are essential for natural and fluent language use (Boonraksa & Naisena, 2022; Evert, 2009; Peters, 2016). The limitations of traditional pedagogical approaches in addressing collocational accuracy have been well documented (Al Ghazali, 2015; Szudarski, 2017). These methods often emphasize isolated vocabulary instruction which lack the contextual richness needed to develop deep lexical awareness. In response, one of the techniques which can bridge this gap is using corpus-based tools such as concordancers. Some studies (e.g., Anthony, 2022; Crosthwaite, 2024; Jeaco, 2017) found that learners with exposure to authentic language corpora can examine real-life lexical patterns and, therefore, develop their understanding inductively.

More than a tool for observation, concordancing embodies principles of constructivist learning. It supports learners in actively constructing meaning through exploration and hypothesis testing, rather than passively receiving instruction (Collentine, 2000; Flowerdew, 2015; O'Keeffe, 2021). According to some studies (Çalışkan & Gönen, 2018; Thurston & Candlin, 1998; Wulff & Baker, 2021), this mode of engagement can improves collocational knowledge as well as learner autonomy, an increasingly valued outcome in language education (Chong & Reinders, 2022; Little, 2022). When learners take initiative to investigate word usage, monitor their progress, and refine their understanding, they begin to develop the self-regulatory habits associated with long-term academic success (Saeed, 2021; Scharle & Szabo, 2000).

However, in contexts such as Iran, the pedagogical potential of concordancing seems to be underutilized. EFL teaching and learning continues to be largely teacher-centered, and possibilities for students to explore real-world language input independently are often limited. As a result, students often depend on L1 transfer strategies when constructing collocations. This might lead to unnatural or incorrect usage patterns (Phoocharoensil, 2011; Yamashita & Jiang, 2010). Therefore, tools that assist learners to notice and internalize conventional language structures can be transformative in such environments.

The next variable in this study is motivation in vocabulary development. Motivation continues to be a major influence on learners' language achievement (Dörnyei, 2020). However, its relationship with data-driven learning (DDL) tools like concordancers has received little attention. According to Argyroulis (2022) and Zare et al. (2022), the exploratory nature of concordancing enhnaces intrinsic motivation since it can make language discovery more interactive and intellectually rewarding. Moreover, exposure to authentic language can stimulate curiosity and enhance learners' sense of agency.

The next variable in the study which remains a constant concern in vocabulary research is retention. Traditional strategies which often employ repetition and rote memorization techniques have shown limited effectiveness in promoting long-term retention (Ahmadian & Tajabadi, 2020; Bjork & Kroll, 2015). In contrast, concordancing's emphasis on repeated and contextualized encounters with lexical items aligns with cognitive theories that emphasize the importance of meaningful processing for memory consolidation (Alexander & Dallachy, 2020; Jalilifar et al., 2014).

Although interest in corpus-based tools has grown, important gaps are evident in the literature. The role of concordancing in enhancing collocational competence has received limited attention in EFL contexts such as Iran. Few studies (Altun, 2021; Mahmoudi-Gahrouei et al., 2025; Saeedakhtar & Seyedasgari, 2018; Zare & Karimpour, 2022) have examined its effects on the interrelated dimensions of learner autonomy, motivation, development, and long-term retention. As a result, little is known about how these variables co-develop within a unified instructional framework. The present study addresses this gap by investigating the multidimensional impact of concordancing on collocational competence, learner autonomy, motivation, and long-term retention.

The present study aims to investigate the pedagogical effectiveness of concordancing as a corpus-based instructional technique in Iranian EFL classrooms. Specifically, it seeks to examine whether concordancing significantly improves Iranian EFL learners' collocational competence and contributes to the long-term retention of collocations. In addition, the study explores the effect of concordancing on learners' motivation toward vocabulary learning and investigates its impact on the development of learner autonomy.

The findings of this study contribute to EFL vocabulary research both theoretically and pedagogically. Theoretically, the study extends data-driven learning research by simultaneously examining the integrated effects of concordancing on collocational competence, motivation, autonomy, and long-term retention. These variables are rarely investigated together within a single framework. Pedagogically, the results can help EFL teachers, teacher trainers, language institutions, curriculum designers, and material developer evidence-based insights into the instructional value of concordancing for promoting deeper lexical learning and learner-centered instruction. Moreover, since the study focuses on the Iranian EFL context, it can provide context-specific evidence that can inform localized pedagogical decision-making.

The integration of collocational competence, retention, motivation, and learner autonomy within a single framework can be supported by some complementary theories such as cognitive processing, noticing, constructivism, and self-determination. Levels of Processing Theory and the Noticing Hypothesis explain how deep attention to collocations through concordancing strengthens retention. Constructivist learning theory accounts for the role of discovery-based corpus exploration in developing learner autonomy, while Self-Determination Theory highlights how autonomy enhances intrinsic motivation. Therefore, these perspectives justify examining these four variables as an interconnected system within a unified research model.

The research is guided by the following questions:

RQ1: What is the impact of concordancing on the development of collocational competence among EFL learners?

RQ2: What is the impact of concordancing on the long-term collocation retention of EFL learners?

RQ3: How does concordancing influence the motivation of EFL learners?

RQ4: To what extent does concordancing enhance the autonomy of EFL learners?

2. Literature Review

2.1. Concordancing and Language Learning

Concordancing is rooted in corpus linguistics and refers to the use of specialized software which supports learners in analyzing comprehensive collections of authentic language examples (Gries, 2009; Wulff & Baker, 2021). Through DDL, students can examine how words are used in real contexts. In details, they can explore usage patterns, collocations, semantic details, and genre-specific variation (Flowerdew, 2015; Quan et al., 2024). This process helps learners to be exposed to language inductively since they can notice patterns and draw conclusions independently. As such, concordancing is consistent with constructivist learning theory, which emphasizes that knowledge is constructed through learners' active engagement with meaningful language input. (Flowerdew, 2015). Moreover, Cognitive models such as Schmidt's (1990) Noticing Hypothesis emphasize the impact of focused attention and context-rich exposure in developing lexis. In parallel, autonomy-supportive pedagogy, which put emphasis on the role of learner agency in supporting engagement and deepening understanding, can provide a complementary lens to concordancing.

2.2. The Challenge of Collocations in EFL Learning

Collocations refer to frequent and context-dependent combinations of words. They are a critical but often neglected aspect of vocabulary knowledge. Collocations can immensely impact students' fluency and natural commutation (Akhter & Nordin, 2022; Bui, 2021). However, learners frequently struggle with them in EFL contexts like Iran since exposure to authentic input is limited (Estaji & Montazeri, 2022; Mohammadi & Mohit, 2021). These difficulties are compounded by an overreliance on L1 translation strategies, decontextualized vocabulary instruction as well as teaching methods that favor memorization over meaning-making (Farrokh, 2012; Schmitt & Schmitt, 2020; Szudarski, 2023). Corpus-based tools can offer a promising response to these pedagogical shortcomings. Concordancing enhances learners' ability to notice and internalize lexical pairings as it shows real-world collocational patterns in varied contexts. Studies by Basal (2017), Chan and Liou (2005), and Daskalovska (2015) demonstrated improved collocational awareness and test performance among students who engaged with concordancing tasks.

2.3. Autonomy in Language Learning

Holec's (1981) definition of learner autonomy has become a central topic in language education. This concept refers to an individual's ability to take responsibility for their learning. In Iran where classroom instruction is rigid and often teacher-centered, opportunities for self-directed learning are often narrow (Hemmati & Aziz Malayeri, 2022; Zohrabi et al., 2012). Autonomy-supportive pedagogy can counterbalance this issue by encouraging learners to take initiative and regulate their learning behavior (Kulakow, 2020). Concordancers can be helpful in promoting such autonomy. These tools have the potential to facilitate linguistic discovery as well as helping learners identify and correct usage patterns independently. Investigations by Cheng (2021), Zaki (2020), and Karpenko-Seccombe (2018) suggested that learners who engage in corpus-based tasks reported more confidence and self-reliance. However, autonomy is not automatically enhnaced by access to tools alone. As Boulton and Cobb (2017) cautioned, without thoughtful instructional design and guided scaffolding, concordancing may overwhelm learners, especially those unfamiliar with corpus methods. Although this study does not focus on instructional design per se, its inclusion of guided concordancing sessions reflects a commitment to balancing learner freedom with necessary support.

2.4. Vocabulary Retention and the Role of Deep Processing

Vocabulary retention is the ability to recall and use lexical items over time. Retention has been a persistent challenge in EFL teaching and learning. Techniques such as rote memorization which are common in language classes often result in shallow processing and limited long-term recall (Nation & Meara, 2019; Sprenger, 2018). The levels-of-processing framework as a cognitive theory (Craik & Lockhart, 1972) explains that active involvement with language material leads to stronger retention. Concordancing which immerses learners in authentic and context-rich input is likely to encourage this kind of cognitive involvement. Empirical findings support this link. Rezaee et al. (2014), Gilquin and Granger (2010), and Golabi (2022) all found that learners who used concordancing tools exhibited stronger immediate recall and more sustained retention of collocational knowledge than peers taught using conventional techniques. Sun and Park's (2023) study confirmed the effectiveness of corpus-informed approaches in building long-term vocabulary knowledge, highlighting concordancing's potential as a memory-supportive instructional strategy.

2.5. Motivation

The role of motivation as a major contributor to language learning achievement is well established in the literature (Darvin & Norton, 2023; Woodrow, 2016). Concordancing, by virtue of its exploratory and discovery-based nature, has the potential to boost learner engagement and intrinsic motivation. Studies by Daskalovska (2015) and Zare et al. (2022) revealed that students found corpus-based tasks stimulating, particularly when they led to learner agency and creativity. Sun and Wang's (2003) study concluded that learners who used concordancing tools experienced higher motivation than those engaged in more traditional vocabulary instruction. They attributed this shift to the increased sense of ownership over learning. However, these motivational benefits are not guaranteed unless proper considerations are focused. As Boulton and Cobb (2017) observed, the

novelty of corpus tools may wear thin without sustained pedagogical innovation. To this end, this study adopts a task-based concordancing approach to maintain learner engagement and prevent cognitive fatigue.

2.6. Research Gaps

As discussed in the literature review, Concordancing offers a wealth of pedagogical opportunities. However, its integration into EFL classes in under-resourced classes is limited. Some practical obstacles continue to impede Concordancing adoption, including insufficient technological infrastructure, limited teacher preparedness, and learners' unfamiliarity with corpus-based tools (Davis & Russell-Pinson, 2004; Römer, 2011; Yoon, 2011). Nonetheless, these logistical limitations can be managed with thoughtfully designed scaffolding, targeted professional development and incremental exposure. Consequently, teachers and students can gradually become comfortable with the affordances of DDL. There are some conceptual gaps in the literature as well concerning Concordancing employment. Although DDL's potential to enhance vocabulary learning is acknowledged in the literature, few empirical studies have explored its role in developing collocational competence and retention. Even scarcer are investigations that consider how concordancing might simultaneously enhance learner autonomy and motivation and how these psychological constructs may interplay to support sustained lexical development. This lack of attention is evident in Iran, where corpus-informed pedagogies are still emerging and largely under-researched. To address the gaps, this investigation seeks to examine the impact of concordancing on four interconnected outcomes which are learners' collocational knowledge and retention, autonomy, and motivational engagement.

3. Methodology

3.1. Research Design and Context

A quasi-experimental quantitative design was adopted to address the impact of concordancing on four key EFL learning outcomes, namely collocational competence and retention, learner motivation, and learner autonomy. Pre-tests, post-tests, and delayed post-tests were used to evaluate both immediate development and long-term retention. This study was conducted in 2024 in a Kian Language Institute, Kerman, Iran. Given the relatively limited exposure to concordancing tools in this context, it provided a relevant environment to assess their potential educational value.

3.2. Participants

The study began with 66 Iranian intermediate EFL students from Kian Institute in Kerman, Iran. Selection of participants was based on their IELTS scores using purposive sampling. In details, to determine language proficiency, all intermediate participants completed the IELTS test. Based on the results, six learners were excluded for scoring outside the target range. Concerning homogeneity of the learners, only students with scores between 5.0 and 5.5, B1 level of CEFR, were included. This process led to a group of 60 intermediate-level learners (30 male and 30 female), aged 18 to 25 (M = 23). Two classes were then randomly placed into experimental and

control groups, each containing 30 learners, with careful attention given to the groups regarding proficiency level, age and gender to ensure baseline equivalence. Ethical approval was obtained before data collection, consent was secured from students, and confidentiality protocols were observed.

3.3. Instruments and Materials

3.3.1. Concordancing Tool

The experimental group used AntConc, free, corpus-based concordancing software, to engage with authentic English corpora. The tool enables users to perform keyword searches, view words in context, and identify collocational patterns. It can enhance learner autonomy as it allows exploration of real-world language data. AntConc is widely regarded as a reliable tool in applied linguistics research (Anthony, 2024), reinforcing its pedagogical and technical relevance in this study.

3.3.2. Collocational Competence and Retention Tests

Three researcher-developed tests including pre-test with multiple-choice items, post-test with fill-in-the-blank items and delayed post-test including sentence-completion items were used to assess collocational competence and retention. Each test has 50 items and each item was worth one point. The three formats were designed to measure the same constructs using different task types, thereby minimizing test-recall bias and enhancing construct validity. Two applied linguistics experts reviewed the instrument to confirm its content validity. A pilot study with a separate group led to refinement based on item discrimination indices. Cronbach's alpha was used to check test reliability, which ranged from 0.71 to 0.74. The results indicated acceptable internal consistency.

3.3.3. Learner Autonomy Questionnaire (LAQ)

To measure learners' autonomy, Zhang and Li's (2004) Learner Autonomy Questionnaire (LAQ) was utilized. It includes 11 items rated on a 5-point Likert scale, along with 10 multiple-choice questions. It is theoretically grounded in well-established models of learning (O'Malley & Chamot, 1990; Oxford, 1990; Wenden, 1998) and has shown strong content validity in prior studies (Dafei, 2007; Nematipour, 2012). In this study, LAQ showed acceptable internal consistency, with a Cronbach's alpha of 0.779.

3.3.4. English Learning Motivation Questionnaire (ELMQ)

To explore the influence of concordancing on learners' motivation Taguchi et al.'s (2009) English Learning Motivation Questionnaire (ELMQ) was used. It consists of 21 Likert-scale items, rated on a 6-point scale. The tool assesses multiple dimensions of motivation and has been previously validated with a Cronbach's alpha of 0.78.

3.3.5. Instructional Material

The material used by both experimental and control groups was from English Collocations in Use: Intermediate (2nd Edition) written by McCarthy and O'Dell (2017). A number of lessons were chosen by the researchers. This textbook was selected as it shows a research-informed approach to teaching collocations and it aligns with CEFR levels and standardized exams such as IELTS.

3.4. Data Collection and Analysis Procedures

Following confirmation of participants' intermediate-level proficiency through the IELTS test, two intact classes were randomly allocated to experimental or control groups. To ensure baseline equivalence across groups, all participants completed three pre-tests prior to the intervention: a collocational competence test, LAQ, and ELMQ. The classes took five weeks and 15 sessions, consisting of three 60-minute sessions each week. In each session 10 collocations were addressed, 150 collocations from the course textbook over the entire treatment period. Both groups were exposed to the same vocabulary items and followed an identical instructional schedule to ensure consistency in content coverage. Experimental group received explicit instruction and guided training in AntConc. Learners were taught how to navigate the software, perform searches, and interpret concordance lines. They analyzed collocational usage in authentic contexts and applied their understanding through sentence and paragraph writing tasks. These tasks were supported by teacher feedback to enhance depth of understanding.

Control group received traditional teacher-led instruction involving dictionary use, memorization of word lists, and structured vocabulary practice, including exercises from the textbook. Both groups had equal exposure to the target collocations and equal instructional time. The instructional content and delivery were closely monitored to reduce potential confounding factors. At the end of the intervention, all participants retook the three initial instruments (now as post-tests) to assess progress. A delayed post-test was given four weeks later (sentence-completion format) to evaluate long-term retention of collocations, with particular attention to differences between the groups. The statistical tests were employed in the analysis include Tests of Normality, Descriptive Statistics, Independent Samples Tests, Mann–Whitney Tests, and a Mixed-Design ANOVA.

4. Results

4.1. The Influence of Using Concordancing on the Development of Collocational Competence and Long-Term Collocation Retention

The first research question examined whether concordancing enhances learners' ability to use collocations effectively over time. The second question assessed whether concordancing supports the long-term retention of collocational knowledge. To address these questions, multivariate analyses were employed to track changes in learner performance across the pre-test, post-test, and delayed post-test phases and to compare the experimental and control groups.

Table 1. Tests of normality for collocation pre-, post-, and delayed post-test scores

		Shapiro-Wilk		
	Control and Experimental Groups	**Statistic**	**df**	**Sig.**
Collocation Pretest	Control	.937	30	.075
	Experimental	.934	30	.063
Collocation Posttest	Control	.967	30	.454
	Experimental	.958	30	.280
Collocation Delayed Posttest	Control	.967	30	.466
	Experimental	.970	30	.530

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table 1 presents the Shapiro–Wilk test results, used to examine whether collocational competence scores followed a normal distribution at three stages, for both control and experimental groups. The results indicated normally distributed data in all conditions. Therefore, the appropriateness of employing parametric procedures, mixed-design ANOVA, to analyze the effects of the intervention is supported.

Table 2. Descriptive statistics for collocation tests' scores by group and time point

\	**Control and Experimental Groups**	**Mean**	**Std. Deviation**	**N**
Collocation Pretest	Control	14.63	1.474	30
	Experimental	14.43	1.382	30
	Total	14.53	1.420	60
Collocation Posttest	Control	38.47	4.508	30
	Experimental	43.93	2.716	30
	Total	41.20	4.606	60
Collocation Delayed Posttest	Control	34.50	4.946	30
	Experimental	43.27	3.300	30
	Total	38.88	6.076	60

The descriptive statistics for collocational competence in pre-test, post-test, and delayed post-test for both the groups are shown in Table 2. Regarding pre-tests, both groups showed similar

levels of performance, with the control class averaging 14.63 (SD = 1.47) and the experimental class averaging 14.43 (SD = 1.38). This finding shows a comparable starting point. After the intervention, the experimental class had a significant development with a post-test mean of 43.93 (SD = 2.72), outperforming the control group, 38.47 (SD = 4.51) which suggests that concordancing had a meaningful impact on learners' collocational competence. This improvement was not short-lived. In the delayed post-test, the experimental class showed high performance (M = 43.27, SD = 3.30). However, control class's scores declined to a mean of 34.50 (SD = 4.95). Therefore, it can be seen that the intervention was effective in both enhancing collocational competence and in supporting its long-term retention.

Table 3. Independent samples test results for collocation pretest scores

		levene's test		**t-test for equality of means**						
									95% Confidence Interval of the Difference	
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**Lower**	**Upper**
Collocation Pretest	Equal variances assumed	.217	.643	.542	58	.590	.200	.369	-.538	.938
	Equal variances not assumed			.542	57.762	.590	.200	.369	-.538	.938

Table 3 presents the independent samples t-test results comparing the pre-test collocational competence scores of the experimental and control groups. No significant difference in variance between the groups was observed (F = 0.217, p = 0.643) which supports the use of the equal variances assumed condition. The t-test revealed no significant difference in pre-test scores between the groups (t(58) = 0.542, p = 0.590). The mean difference was 0.200 (SE = 0.369), with a 95% confidence interval ranging from −0.538 to 0.938. These results confirm that the groups were comparable before the intervention and indicate no initial differences in collocational knowledge.

Table 4. Independent samples effect size estimates for collocation pretest scores

		Standardizer[a]	Point Estimate	95% Confidence Interval	
				Lower	Upper
Collocation Pretest	Cohen's d	1.428	.140	-.367	.646
	Hedges' correction	1.447	.138	-.363	.638
	Glass's delta	1.382	.145	-.364	.651

a. The denominator used in estimating the effect sizes.

Cohen's d uses the pooled standard deviation.

Hedges' correction uses the pooled standard deviation, plus a correction factor.

Glass's delta uses the sample standard deviation of the control group.

As shown in Table 4, the effect size analysis revealed no meaningful difference between the experimental and control groups prior to the intervention. Cohen's d, Hedges' d, and Glass's Δ were 0.140, 0.138, 0.145 respectively, all of which are considered small. Also, the 95% confidence intervals for these values included zero, showing that any difference was likely due to chance. These findings suggest that the two groups had comparable levels of collocational knowledge before the intervention, which supports the fairness and validity of later comparisons.

Table 5. Multivariate Tests[a] for the main effect of time and the time × group interaction across all three time points

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Time	Pillai's Trace	.982	1569.952[b]	2.000	57.000	.000	.982
	Wilks' Lambda	.018	1569.952[b]	2.000	57.000	.000	.982
	Hotelling's Trace	55.086	1569.952[b]	2.000	57.000	.000	.982
	Roy's Largest Root	55.086	1569.952[b]	2.000	57.000	.000	.982
Time * Groups	Pillai's Trace	.688	62.745[b]	2.000	57.000	.000	.688
	Wilks' Lambda	.312	62.745[b]	2.000	57.000	.000	.688
	Hotelling's Trace	2.202	62.745[b]	2.000	57.000	.000	.688
	Roy's Largest Root	2.202	62.745[b]	2.000	57.000	.000	.688

a. Design: Intercept + Groups

Within Subjects Design: Time

b. Exact statistic

As shown in Table 5, multivariate analysis revealed a significant main effect of time on collocational competence, with all tests (Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root) confirming this result, $F(2, 57) = 1569.952$, $p < .001$, $\eta p^2 = .982$. These suggest a significant improvement in learners' collocation knowledge over time. Additionally, the Time × Group interaction was statistically significant, $F(2, 57) = 62.745$, $p < .001$, $\eta p^2 = .688$, indicating that the pattern of improvement differed significantly between the two groups. These outcomes show the positive effect of time on collocation development as well as the specific advantage afforded by the concordancing intervention.

Table 6. Mauchly's test of Sphericity[a] and Epsilon corrections for the effect of time

					Epsilon[b]		
Within Subjects Effect	**Mauchly's W**	**Approx. Chi-Square**	**df**	**Sig.**	**Greenhouse-Geisser**	**Huynh-Feldt**	**Lower-bound**
Time	.174	99.627	2	.000	.548	.560	.500

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + Groups

Within Subjects Design: Time

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Mauchly's Test of Sphericity showed that the assumption of sphericity was violated for the within-subjects effect of Time ($W = 0.174$, $\chi^2(2) = 99.627$, $p < .001$). To ensure accurate interpretation of the within-subjects effects, sphericity corrections were applied using Greenhouse–Geisser ($\epsilon = 0.548$), Huynh–Feldt ($\epsilon = 0.560$), and Lower-Bound ($\epsilon = 0.500$) adjustments.

Table 7. Tests of within-subjects effects for time and time × group interaction

Source		**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**
Time	Sphericity Assumed	26188.011	2	13094.006	1992.500	.000	.972
	Greenhouse-Geisser	26188.011	1.095	23907.688	1992.500	.000	.972
	Huynh-Feldt	26188.011	1.120	23385.953	1992.500	.000	.972
	Lower-bound	26188.011	1.000	26188.011	1992.500	.000	.972

Time * Groups	Sphericity Assumed	617.011	2	308.506	46.945	.000	.447
	Greenhouse-Geisser	617.011	1.095	563.285	46.945	.000	.447
	Huynh-Feldt	617.011	1.120	550.992	46.945	.000	.447
	Lower-bound	617.011	1.000	617.011	46.945	.000	.447
Error(Time)	Sphericity Assumed	762.311	116	6.572			
	Greenhouse-Geisser	762.311	63.532	11.999			
	Huynh-Feldt	762.311	64.949	11.737			
	Lower-bound	762.311	58.000	13.143			

Table 7 shows a significant main effect of Time in the within-subjects analysis, $F = 1992.500$, $p < .001$, $\eta p^2 = .972$, indicating that participants' collocational competence scores changed significantly during the study. More importantly, the Time × Group interaction was also significant, $F = 46.945$, $p < .001$, $\eta p^2 = .447$, meaning the two groups did not improve in the same way. The experimental group revealed a stronger and different form of improvement in comparison with the control group. Therefore, the positive impact of the concordancing intervention on collocation learning over time is supported.

Table 8. Tests of within-subjects contrasts for time and time × group interaction across pre-test, post-test, and delayed post-test

Source	Time	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time	Linear	17787.675	1	17787.675	1711.441	.000	.967
	Quadratic	8400.336	1	8400.336	3054.774	.000	.981
Time * Groups	Linear	603.008	1	603.008	58.018	.000	.500
	Quadratic	14.003	1	14.003	5.092	.028	.081
Error(Time)	Linear	602.817	58	10.393			
	Quadratic	159.494	58	2.750			

As shown in Table 8, the within-subjects contrasts indicated a significant linear change for Time, $F = 1711.441$, $p < .001$, $\eta p^2 = .967$, as well as a significant quadratic trend, $F = 3054.774$, $p < .001$, $\eta p^2 = .981$. These results indicate significant changes in collocational competence across the three test phases, with both linear and nonlinear patterns contributing to the observed progression. Regarding the Time × Group interaction, both the linear trend ($F = 58.018$, $p < .001$, $\eta p^2 = .500$) and the quadratic trend ($F = 5.092$, $p = .028$, $\eta p^2 = .081$) were statistically significant.

This denotes that not only did the magnitude of improvement differ between the groups, but their developmental trajectories over time also varied.

Table 9. Tests of between-subjects effects for the group variable on average collocation performance

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	179046.272	1	179046.272	8765.501	.000	.993
Groups	984.672	1	984.672	48.206	.000	.454
Error	1184.722	58	20.426			

As can be seen in Table 9, the between-subjects analysis showed a significant group effect, $F = 48.206$, $p < .001$, $\eta p^2 = .454$. This indicates that the experimental group outperformed the control group in collocational competence. The large partial eta squared value confirms that group membership accounted for a considerable proportion of the variance. Additionally, the Intercept was significant, $F = 8765.501$, $p < .001$, $\eta p^2 = .993$, which reflects the overall mean performance level across all participants.

4.2. The Effect of Concordancing on the Motivation of EFL Learners

The third question explored how concordancing influenced EFL learners' motivation. To evaluate potential differences, ELMQ was administered to participants in both the groups.

Table 10. Tests of normality for motivation scores

		Shapiro-Wilk		
	Control and Experimental Groups	**Statistic**	**df**	**Sig.**
Motivation Pretest	Control	.880	30	.003
	Experimental	.879	30	.003
Motivation Posttest	Control	.933	30	.059
	Experimental	.856	30	.001

Table 10 shows Shapiro–Wilk test results for motivation score normality. Pre-test results showed non-normal distributions in both groups (p = .003). At post-test, the control group's scores approached normality (p = .059), whereas the experimental group's scores continued to significantly deviate (p = .001). Given these findings and due to non-normality, motivation data were analyzed using the Mann–Whitney U test.

Table 11. Mann-Whitney test: Motivation scores by group at pretest and posttest

	Control and Experimental Groups	N	Mean Rank	Sum of Ranks
Motivation Pretest	Control	30	29.80	894.00
	Experimental	30	31.20	936.00
	Total	60		
Motivation Posttest	Control	30	21.87	656.00
	Experimental	30	39.13	1174.00
	Total	60		

Motivation score differences between the groups are shown in Table 11. At pre-test, motivation scores did not differ significantly, with mean ranks of 29.80 (control) and 31.20 (experimental). This indicates learners' homogeneity at baseline. However, at post-test, the experimental class showed a clear improvement, with a mean rank of 39.13 versus 21.87 for the control group. The significant difference suggests that the concordancing intervention positively influenced learners' motivation.

Table 12. Mann–Whitney U test statistics for motivation scores at pretest and posttest

	Motivation Pretest	Motivation Posttest
Mann-Whitney U	429.000	191.000
Wilcoxon W	894.000	656.000
Z	-.326	-3.922
Asymp. Sig. (2-tailed)	.744	.000

a. Grouping Variable: Control and Experimental Groups

Table 12 shows no significant pre-test difference in motivation between groups (U = 429.000, p = .744), indicating similar baseline levels. However, at post-test, a significant difference was

found (U = 191.000, p < .001), with the experimental class showing higher motivation. This supports the positive impact of the concordancing intervention.

4.3. The Impact of Concordancing on the Autonomy of EFL Learners

The fourth research question examined the impact of concordancing on EFL learners' autonomy. To assess this construct, LAQ was employed.

Table 13. Tests of normality for autonomy scores

	Control and Experimental Groups	Shapiro-Wilk		
		Statistic	df	Sig.
Autonomy Pretest	Control	.819	30	.000
	Experimental	.857	30	.001
Autonomy Posttest	Control	.891	30	.005
	Experimental	.793	30	.000

The results of the Shapiro–Wilk test in Table 13 revealed significant departures from normality in autonomy scores for both groups at both testing stages. For the control group, the p-values were .000 (pre-test) and .005 (post-test), while in the experimental class, they were .001 (pre-test) and .000 (post-test). These results confirm a violation of normality, justifying the use of the non-parametric Mann–Whitney U test for analyzing autonomy data.

Table 14. Mann-Whitney test: Autonomy scores by group at pretest and posttest

	Control and Experimental Groups	N	Mean Rank	Sum of Ranks
Autonomy Pretest	Control	30	30.53	916.00
	Experimental	30	30.47	914.00
	Total	60		
Autonomy Posttest	Control	30	20.95	628.50
	Experimental	30	40.05	1201.50
	Total	60		

Table 14 reports the results of the Mann–Whitney U test comparing autonomy scores between the two groups at both the pre-test and post-test stages. Pre-test mean ranks were almost the same between groups, 30.53 (control) and 30.47 (experimental). This indicates initial equivalence and no significant difference in autonomy levels before the intervention. However, at post-test, the experimental group's mean rank rose to 40.05, while the control group's dropped to 20.95. This significant difference suggests a significant improvement in learner autonomy among those in the experimental class. Thus, these results provide additional support for the effectiveness of the concordancing intervention.

Table 15. Mann–Whitney U test statistics for autonomy scores at pretest and posttest

	Autonomy Pretest	Autonomy Posttest
Mann-Whitney U	449.000	163.500
Wilcoxon W	914.000	628.500
Z	-.016	-4.404
Asymp. Sig. (2-tailed)	.987	.000

a. Grouping Variable: Control and Experimental Groups

Table 15 shows no significant pre-test difference in autonomy scores between groups ($U = 449.000$, $p = .987$), confirming initial comparability. However, a significant difference emerged at the post-test stage ($U = 163.500$, $Z = -4.404$, $p < .001$), with the experimental group showing significantly higher autonomy scores. Concordancing appears to have meaningfully enhanced learners' autonomy.

Taken together, the results highlight that concordancing had a strong positive impact across all four research areas. First, it significantly improved collocational competence. Second, the intervention supported long-term retention of collocational knowledge. In addition to linguistic developments, concordancing contributed to affective and behavioral factors in the study. In details, the rise in motivation among experimental group learners indicated that interacting with authentic language data can make learning more engaging. Lastly, the use of concordancing enhanced learners' autonomy as it helped learners to exercise control over their own learning and explore language patterns independently. These results show the multidimensional benefits of concordancing in EFL contexts.

5. Discussion

5.1. The Role of Concordancing in Collocation Learning and Retention

The first two research questions focused on the effect of concordancing on Iranian EFL learners' collocational development and long-term retention. The findings revealed that concordancing is an

effective strategy for enhancing learners' collocational competence and long-term retention of collocations. This improvement likely stems from concordancing's focus on authentic and context-rich language use, which contrasts with rote memorization in traditional methods. Learners who encounter collocations in real-world contexts can better recognize patterns and understand how word combinations function (Alexander & Dallachy, 2020; Behzadian, 2016; Chan & Liou, 2005; Golabi, 2022; Jalilifar et al., 2014; Rets, 2017). Moreover, Concordancing is a type inductive learning since it encourages learners to explore and analyze language patterns. In addition, concordancing aligns with constructivist theory (Collentine, 2000). It also supports cognitive models such as the levels-of-processing theory that link deeper engagement to better retention. Additionally, concordancing promotes conscious awareness and enhances noticing, as emphasized in Schmidt's (1990) hypothesis which leads to more effective internalization of collocational patterns.

Another factor behind the experimental group's success was the constant exposure to accurate and real-world language through concordance lines. This feedback helped reduce L1 interference, especially important for Iranian learners who often rely on literal translations from Persian (Cheng, 2021; Zaki, 2020). Authentic input played a corrective role by helping learners distinguish natural from unnatural collocations. Consistent with SLA research, repeated encounters with collocations in varied contexts likely strengthened memory (Nation & Meara, 2019; Sprenger, 2018). This deep and analytical engagement enhanced durable learning, consistent with the levels-of-processing theory. The rich contexts provided multiple retrieval cues which aided recall (Anthony, 2022; Gries, 2009; Jeaco, 2017; Pustejovsky & Stubbs, 2012; Wulff & Baker, 2021).

Since collocations are often arbitrary and lack clear L1 equivalents, they can be especially challenging for EFL learners (Al Ghazali, 2015; Bui, 2021; Evert, 2009; Farrokh, 2012; Peters, 2016; Szudarski, 2017; Zaabalawi & Gould, 2017). Traditional methods rarely provide the contextualized repetition needed for their development. Concordancing fills this gap since it provides repeated and meaningful exposure to collocations in authentic discourse (Alsahafi, 2022; Çalışkan & Gönen, 2018; Golabi, 2022; Poole, 2012; Quan et al., 2022; Rezaee et al., 2014; Thurston & Candlin, 1998; Wulff & Baker, 2021; Yılmaz & Soruç, 2015). It also boosted learners' metalinguistic awareness which impacts reflection and deeper understanding. These are key ingredients for lasting knowledge. These findings are consistent with earlier research. Rezaee et al. (2014) reported better collocation retention in learners using concordancing than in those taught through conventional means. Gilquin and Granger (2010) also found that concordancing improved both immediate and long-term recall. Likewise, Basal (2017), Chan and Liou (2005), and Daskalovska (2015) highlighted the positive role of concordancing in enhancing collocational competence and retention.

5.2. The Role of Concordancing in Boosting Learner Motivation

The third research question examined if concordancing influenced learners' motivation. Motivation levels in the experimental group significantly improved, according to the results, which highlights concordancing's potential to make learning more engaging. This increase likely was the result of

its discovery-based approach in which learners analyze real language data, identify patterns, and build knowledge independently. These can impact intrinsic motivation (Argyroulis, 2022; Daskalovska, 2015; Flowerdew, 2015; Zare et al., 2022). Moreover, the authenticity of input impacted students' motivation. Encountering practical and real-world examples such as "make a decision" made learning more relevant and meaningful (Anthony, 2022; Jeaco, 2017; Pustejovsky & Stubbs, 2012). In addition, concordancing offered ongoing feedback through real usage patterns, helped learners gain confidence and, therefore, encouraged continued effort (Cheng, 2021; Zaki, 2020). These results align with previous research showing that concordancing increases motivation due to its potential to make learning more interactive and cognitively stimulating (Argyroulis, 2022; Daskalovska, 2015; Sun & Wang, 2003; Zare et al., 2022).

5.3. The Role of Concordancing in Supporting Learner Autonomy

The fourth research question explored whether concordancing affects learner autonomy. It was found that it significantly enhanced Iranian intermediate EFL learners' autonomous learning. This finding might be attributed to concordancing features such as giving learners access to authentic language data, encouraging them to independently explore patterns and draw conclusions, as well as moving beyond teacher-centered instruction (Alagözlü, 2017). This practical approach boosted learners' confidence in solving language problems on their own (Karpenko-Seccombe, 2018). Another key strength of concordancing is related to its ability to promote critical thinking. Those learners who worked with concordance lines could analyze word frequency, grammar, collocations, and context. These skills are essential for coping with unfamiliar language situations (Flowerdew, 2015). This process turned learners into active knowledge builders and is in line with autonomy-supportive pedagogy in which the teacher functions as a learning facilitator than a central authority (O'Keeffe, 2021; Zare et al., 2021).

Furthermore, concordancing provides enough exposure to real and varied language and prepares learners for practical communication in which they can apply patterns flexibly in new situations (Alexander & Dallachy, 2020; Basal, 2017; Behzadian, 2016; Golabi, 2022; Jalilifar et al., 2014; Rets, 2017). The reflective nature of concordancing is another advantage. It enables learners to monitor their progress, compare their assumptions with actual usage, and adjust strategies. These skills are vital for self-regulated, long-term language development. Some similar studies (e.g., Alagözlü, 2017; Cheng, 2021; Karpenko-Seccombe, 2018; O'Keeffe, 2021; Zaki, 2020) support the findings and highlight concordancing's role in enhancing learner autonomy and independent correction strategies.

6. Conclusion

This study explored how concordancing affects Iranian intermediate EFL learners, particularly in learning and remembering collocations, and in boosting their motivation and autonomy. The results showed that concordancing outperformed traditional methods in improving collocational knowledge and retention. The nature of concordancing in presenting authentic and context-rich input can encourage deeper thinking as well as helping bridge the gap between recognizing and remembering language patterns. These findings support key learning theories such as Craik and

Lockhart's (1972) Levels of Processing Theory and Schmidt's (1990) Noticing Hypothesis. In addition to language improvements, concordancing promoted learner motivation and autonomy since it has the potential to encourage a more active and discovery-based learning process. Overall, the results highlight concordancing's value as a useful tool in modern EFL classrooms.

6.1 Implications

The results of this investigation suggest several instructional implications. Adding concordancing tools in EFL classes can help move beyond rote learning and enhance learners' awareness of linguistic patterns. Teachers are encouraged to allocate some class time or assignments to concordancing to expose their students to authentic and context-rich language. Moreover, concordancing can lead to a shift in the teacher's role from knowledge transmitter to learning facilitator who guides learners in exploring language independently. This shift promotes autonomy and can strengthen analytical thinking. Moreover, it can lead to reduced reliance on teacher input. Additionally, concordancing can help address L1 interference through providing accurate and varied examples of L2 usage and supporting more natural language production. In contexts like Iran, providing EFL teachers with targeted training can enhance their ability to use concordancing in pedagogically meaningful ways.

6.2 Recommendations

This study showed the potential of concordancing to improve EFL learners' collocational competence, motivation, autonomy, and retention. However, some limitations should be noted. The small and localized sample of 60 learners from a single language institution in Kerman, Iran limits the generalizability of the results. The five-week intervention may also have been too brief to capture long-term learning effects. Relying solely on AntConc restricted exploration of other tools with different educational features. Instructional design factors such as limited digital literacy support and unmonitored teacher input may have affected outcomes. Additionally, although the assessment tools were validated, their lack of standardization and repeated use could have influenced learner responses. The four-week delayed post-test, while useful for short-term retention, was not long enough to evaluate lasting retention. To address these issues, future studies are recommended to include more diverse and larger samples and adopt longer-term designs to better capture sustained learning. Comparing various concordancing tools, including AI-driven and mobile-based options, could reveal how different interfaces affect engagement. Digital literacy training and collaborative tasks may also enhance learner involvement. Finally, using mixed methods, standardized assessments, and extended follow-up can give a clearer picture of how concordancing affects EFL learners.

Author Contributions

All authors contributed equally to the conceptualization of the article and writing of the original and subsequent drafts.

Data Availability Statement

Data available on request from the authors

Conflict of Interest

The authors declare no conflict of interest.

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