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Research Article

The Relationship Between Reading Fluency, Writing Fluency, and Vocabulary of Turkish as a Foreign Language Learners

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Abstract: In the acquisition of a foreign language, discerning the interplay among language skills is imperative to enhance and streamline the learning process. Our understanding of the interrelationships between language skills in the context of acquiring Turkish as a foreign language remains constrained. This study delves into the relationships among language skills in the context of foreign language acquisition by exploring the relationships between reading fluency (speed and accuracy), writing fluency (total word count, speed, and accuracy), and vocabulary (total word count, number of different words, types/token ratio) among 126 Turkish language learners. The investigation considered proficiency level (A1-C1) for comparisons, in addition to exploring the relationships between the aforementioned language skills. Reading fluency data was collected through the selection of texts from textbooks, while writing fluency data was obtained by instructing participants to engage in rapid writing for a duration of 2 minutes. Vocabulary data were derived from participants' responses in end-of-year exam papers. Data collected in 2021 across five language proficiency levels underwent statistical analyses, including one-way ANOVA and Pearson and Spearman correlations. The study found significant statistics for language proficiency levels, especially for the B2 level. Significantly, correlations emerged among reading, writing, and vocabulary. Importantly, these correlations exhibited variability with increasing language proficiency, underscoring the evolving nature of the relationship between language skills in foreign language learning.

Keywords: Reading Fluency, Writing Fluency, Vocabulary, Foreign Language, Turkish as a Foreign Language

1. Introduction

Language encompasses diverse linguistic elements, including syntax, semantics, and morphology. Within the realm of linguistic knowledge acquisition, vocabulary assumes a pivotal role in language learning and application (Chen, 2021). Notably, an estimate posits that in English, approximately 50% of spoken language comprises the fifty most frequently used words, with 95% of spoken language and 80% of written language comprehensible through familiarity with the top 2,500 words (Thornbury, 2005). Further emphasizing its significance, robust vocabulary acquisition facilitates the execution of language skills in the context of foreign language learning (Aksoy, 2020; Bandini et al., 2017), thereby positioning vocabulary enhancement as an integral facet of foreign language acquisition.

The overarching goal of reading is text comprehension, and reading fluency serves as a prerequisite in this pursuit (National Reading Panel, 2000). Empirical evidence underscores a correlation between reading speed and reading comprehension within the context of foreign language learning (Güngör, 2019; Jiang, 2013). Conversely, effective written communication necessitates the adept handling of numerous challenges, with writing fluency emerging as a crucial consideration (Alamargot and Fayol, 2013). Within the realm of second language (L2) acquisition, writing fluency assumes particular importance as a critical aspect of the writing process (Phuoc and Barrot, 2022). Both reading and writing fluencies represent proficiency levels essential for language learners, as their automatization allows individuals to allocate cognitive resources to more advanced cognitive processes (Chenoweth and Hayes, 2001; LaBerge and Samuels, 1974).

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Interconnections between reading, writing, and vocabulary have been identified in foreign language learners (Baştürk and Bilge, 2022; Karakoç, 2016; Stæhr, 2008). Existing research suggests that vocabulary knowledge, for instance, may facilitate the development of reading fluency (Taguchi et al., 2021), enhance reading comprehension (Beck et al., 1982), and contribute to the production of lengthier written texts (Bilge and Demirel, 2022). These findings underscore the interconnectedness of language skills, indicating a web of correlations that merits exploration. Understanding such correlational patterns may yield insights into foreign language learning processes, especially considering potential variations over time and experience in language acquisition (Agustin Llach, 2010; Güngör, 2019; Tömen, 2016) and across different languages (Johansson and Rijlaarsdam, 2023). However, we have limited knowledge about the relationships between language skills especially in students who learn Turkish as a foreign language. In addition, there are very limited studies on the skills of interest in this study (especially reading fluency and writing fluency). Since fluency needs to be acquired in order to reach the high-level goals of reading and writing, comparing the status of Turkish as a foreign language learners in these skills can provide important insights into the effectiveness of the language teaching process.

Consequently, this study seeks to address the following question:

1. Are there significant differences among Turkish as a foreign language learners in terms of language proficiency level (A1-C1) in reading fluency, writing fluency, and vocabulary?

2. What is the relationship between reading fluency, writing fluency, and vocabulary among Turkish as a foreign language learners across proficiency levels from A1 to C1?

1.1. Reading fluency in foreign language

Section headings: Only the first letter of each word in the first heading should be capitalized. The first heading should be left-aligned and written in bold.

Reading is a multifaceted process that encompasses a spectrum of cognitive skills, ranging from low-level to high-level cognitive functions. This complexity is further heightened when reading in a foreign language (Grabe and Yamashita, 2022; Han and Anderson, 2009). Reading in a foreign language, characterized by increased demands on the reader, involves numerous sub-skills such as comprehension, vocabulary, grammar, and pronunciation. It necessitates heightened proficiency in word recognition, grammar, and cultural knowledge (Farahani and Kouhpaeenejad, 2017). Among these subcomponents, reading fluency assumes a paramount role for foreign language learners, exerting influence on both reading comprehension and reading motivation (Grabe and Yamashita, 2022; Han and Anderson, 2009; Farahani and Kouhpaeenejad, 2017). The significance of reading fluency lies in its impact on reading comprehension and motivation. Proficient readers, by engaging in automatic, accurate, and appropriately paced reading with prosodic elements, gain the advantage of focusing more on the meaning of the text. Simultaneously, fluency positively influences reading motivation, fostering a desire to read more and providing readers with ample opportunities for further practice. Consequently, this extended practice facilitates familiarity with the vocabulary and culture of the foreign language through increased exposure to reading materials. Conversely, struggling with non-fluent reading impedes readers from engaging with texts in the foreign language, leading to reduced exposure to vocabulary and grammatical structures and hindering overall language skill development.

Existing literature underscores the pivotal role of reading fluency in foreign language reading comprehension (Taguchi et al., 2016) and advocates for the incorporation of fluency development activities in foreign language education (Bui and Macalister, 2021; Hidayah and Trisusana, 2021). Research demonstrates that reading fluency strategies significantly enhance students' reading skills in a foreign language (Aka, 2019; Gorsuch and Taguchi, 2008; Matsui and Noro, 2010; Nakanishi, 2015;

Taguchi and Gorsuch, 2002, 2012; Taguchi et al., 2012) and positively influence their reading attitudes (Ateek, 2021; Bui and Macalister, 2021; Zhou and Day, 2021, 2023). Hence, it is imperative to underscore fluency training in foreign language teaching and to conduct studies on reading fluency development employing proven effective strategies to enhance readers' proficiency in a foreign language.

1.2. Writing fluency in foreign language

Writers encounter numerous challenges in the expression of their thoughts. Proficiency in writing fluency is imperative for authors to transcribe their ideas before they fade from memory (Chenoweth and Hayes, 2001). The importance of fluency extends beyond mere transcription, as its impact on the quality of written text is evident. The nexus between text quality and handwriting appears to be associated with the cognitive load placed upon the writer (Beard et al., 2009). When writers expend cognitive resources on low-level aspects of writing, such as word choice and punctuation, their capacity to engage in higher-order processes, such as audience consideration and content planning, may be compromised (Alamargot and Fayol, 2013), potentially diminishing the overall quality of the written composition.

Additionally, the proficiency of a writer is intricately linked to the speed of text generation (Wolfe-Quintero et al., 1998). In the realm of second language (L2) writing, writing fluency stands out as a defining variable that distinguishes levels of proficiency (Phuoc and Barrot, 2022). This underscores the significance of writing fluency as a key determinant of overall writing proficiency in the L2 context.

1.3. Vocabulary in foreign language

The acquisition of vocabulary stands out as a pivotal dimension in the process of learning a foreign language. Researchers posit that a distinct vocabulary size is requisite to attain proficiency at specific levels within the target language being studied (Nation and Waring, 1997). Furthermore, investigations reveal that the stipulated vocabulary size prerequisites for designated language proficiency levels (e.g., A1, A2) exhibit variability across languages and geographic locations (Milton and Alexiou, 2009). Consequently, it becomes evident that vocabulary acquisition is subject to diverse influencing factors, encompassing variables such as the specific foreign language under study, the geographical location of language acquisition, and the proficiency level of the learner. The intricacies of these factors contribute to the variability in vocabulary size mandates corresponding to distinct language proficiency levels.

1.4. The relationship between reading fluency, writing fluency, and vocabulary

Numerous studies have delved into the intricate connections among reading, writing, and vocabulary. Notably, research on Turkish as a foreign language learners has indicated that individuals possessing an enriched vocabulary demonstrate an ability to produce lengthier written texts (Bilge and Demirel, 2022). Additionally, investigations have highlighted the correlation between writing fluency and reading fluency in the context of second language (L2) acquisition (Johansson and Rijlaarsdam, 2023). It is noteworthy, however, that the dynamics of these relationships may exhibit variability across different languages (Johansson and Rijlaarsdam, 2023) and are subject to alterations contingent upon language experience (Tömen, 2016).

Given the potential nuances in these relationships, an examination of these skills within distinct language level groups in the context of Turkish as a foreign language learners may yield consequential insights. Such an investigation has the potential to unveil valuable findings that contribute to our understanding of the interplay among reading, writing, and vocabulary within the specific framework of Turkish language acquisition as a foreign language.

2. Method

This study aims to determine the relationship between reading fluency, writing fluency, and vocabulary variables. Therefore, the study employed a correlational research design to investigate the relationships among the collected variables, as outlined by Fraenkel and colleagues (2012). The choice of a correlational design was deemed appropriate, aligning with the research objective of analyzing the associations between measurements of reading fluency, writing fluency, and vocabulary.

The subsequent subsections provide detailed descriptions of the sample selection, instruments employed, data collection methods, and the analytical procedures undertaken in this research.

2.1. Participants

The study comprised 126 participants, all of whom were engaged in the process of learning Turkish as a foreign language at the Turkish Language Teaching Application and Research Center of Uludağ University. These participants hailed from 26 distinct countries, contributing to a diverse yet homogenous representation in terms of nationality. In order to ensure the integrity of the correlational analysis, participants lacking data for at least one measurement were excluded from the sample. This stringent criterion was applied, recognizing that correlational analyses necessitate the availability of data for all variables across all participants.

For a comprehensive overview of the demographic composition of the participants, refer to Table 1, which outlines pertinent statistics related to the participants' backgrounds.

Table 1

Demographic Descriptions and Descriptive Statistics of Participants

Level		Male	RF-S	RF-A	WF-T	WF-S	WF-A	V-D	V-T	TTR
A1	Male Female	17 9	63,6	89,2	19,9	13,8	70	41,5	73	57,2
A2	Male Female	18 11	56,6	87,7	22,1	15,3	69,7	55	94,4	59,2
B1	Male Female	21 9	56,8	92,3	23,3	20	85,2	53,5	86,3	62,8
B2	Male Female	20 11	84,3	94,2	31,3	27,7	87,8	74,9	127,1	60,5
C1	Male Female	6 4	67,4	93,9	25	20,5	81,3	70,2	127,6	56,8
Total		126	65,8	91,2	24,4	19,6	78,8	58	98,7	59,8

RF-S: Reading speed RF-A: Reading accuracy WF-T Total words in writing fluency WF-S: Speed in writing fluency WF-A: Accuracy in writing fluency V-D: Number of different words in vocabulary V-T: Number of total words TTR: Types/tokens ratio

Participants in the study demonstrated varying reading speeds within the range of 56.6 to 84.3 words, coupled with accuracy rates spanning from 87.7% to 94.2%. This places their reading speeds in the realm of 3rd and 4th-grade students reading in their native language, as established by Akyol et al. (2014). It is noteworthy that, according to Rasinski's classification for native speakers (2010), the reading accuracy observed in the A1 and A2 groups fell within the frustration level, while the other groups operated at the instructional level.

Regarding writing proficiency, participants collectively produced a range of 19.9 to 31.3 words in a two-minute interval. The writing speed varied from 13.8 to 27.7 words, accompanied by accuracy rates ranging from 69.7% to 87.8%.

In terms of vocabulary usage, participants employed a total of 73 to 127.6 words, with the number of distinct words falling within the range of 41.5 to 74.9. The types-to-tokens ratio exhibited variability, ranging from 56.8 to 62.8.

2.2. Materials and instruments

In the present study, the assessment encompassed three main domains: reading fluency (comprising speed and accuracy), writing fluency (encompassing total words, speed (number of accurate words), and accuracy percentage), and vocabulary (comprising different words, total words, and type/token ratio).

Reading fluency assessments were conducted using texts specifically selected for each proficiency level from Turkish language teaching books published by a different publishing house than those used by the participants. These texts, ranging from 285 to 405 words, were administered to participants, who were instructed to read aloud for one minute. Reading speed was determined by counting insertions, omissions, and mispronunciations, with the corresponding words deducted from the total count to calculate reading speed. Reading accuracy was calculated as the ratio of speed to total words. Given the established reliability of single-expert assessments in reading fluency (Bilge, 2022; Bilge and Kalenderoğlu, 2022; Rasinski et al., 2005, 2017), evaluations were performed by a researcher possessing a Ph.D. in reading fluency.

For writing fluency, participants were directed to write as quickly as possible on a blank sheet of paper, without emphasis on additional features such as coherence. They were provided with four prompts, such as "Tell us about your hobbies" or "Introduce your country," but were given the freedom to write on any topic. A one-minute planning period preceded a two-minute writing duration. Three variables were derived: total words (including misspelled and nonsensical words), writing speed (considering only correctly spelled words, factoring in suffix and letter accuracy), and writing accuracy (proportional to total words). All assessments were conducted and interpreted based on two minutes of writing. The nature of writing fluency, being a word-counting task, obviated the need for a second rater (Bilge and Kalenderoğlu, 2022; Stæhr, 2008), with the second researcher, holding a Ph.D. in writing fluency, undertaking the measurements.

Vocabulary data were derived from end-of-course exams, chosen for their assumed ability to elicit more authentic responses. In these exams, participants were allotted 30 minutes and tasked with producing a text of a specified minimum word count based on proficiency levels. Simple Concordance Program facilitated the analysis of all participant texts, yielding three variables: different words (indicating productive vocabulary), total words (reflecting writing length), and the percentage (depicting the type/token ratio— the ratio of different words to total words).

The data collection for this study was conducted during the summer of 2021. The second author visited the school after obtaining the necessary permissions. Given that the first author was already affiliated with the school, they actively participated in the collection of all data. The language levels of participants were taken by the first researcher from the school.

For the reading fluency assessment, individual participants were taken to an empty classroom, where they were instructed to read aloud, and their readings were recorded. For the writing fluency assessment, students were grouped by proficiency level (A1, A2, etc.) in a classroom setting. They were directed to write as quickly as possible without emphasizing higher-level aspects of writing such as coherence. A one-minute planning period was provided, followed by a two-minute writing interval, during which erasers were not permitted.

Vocabulary data, obtained from school exams, required no special data collection procedures. Copies of the exam papers were acquired for the assessment of vocabulary measurements.

2.3. Data analysis

Two primary analyses were conducted in this study: one-way ANOVA, and correlation analyses (Pearson and Spearman Brown). Prior to analysis, the normality of variables was assessed. Skewness and kurtosis values within ±2 were considered indicative of normal distributions (George and Mallery, 2019). To facilitate normal distribution for parametric tests, such as one-way ANOVA, extreme values were excluded (up to 10 extreme values discarded at most at a time). Post hoc tests utilized Gabriel when equal variances were assumed and Games-Howell when equal variances were not assumed. Effect sizes were interpreted as small (0.01–0.06), medium (0.06–0.14), and large (>0.14) (Green and Salkind, 2014).

Correlation analyses employed Pearson correlation when data were normally distributed. In cases where variables had extreme values, and excluding these values might introduce bias to the sample, or when data were not normally distributed or had a relatively low number of participants, Spearman Brown correlation was utilized. Correlation coefficients were interpreted as small (0.10–0.29), medium (0.30–0.49), and large (0.50–1.00) effects, regardless of the sign (Green and Salkind, 2014).

3. Findings

In this section, results are given[1].

[1] In this section, correlation tables are given in the Appendices due to the large number and complexity of the tables.

Table 2

One way ANOVA Analysis of Differences Between Language Levels According to Variables

		Sum of Means	*sd*	Sum of Squares	*F*	*p*	Groups	Effect Size (η^2)
RF-S	Between Groups	18110,2	4	4527,6	9.613	.00*	-B2 > A1, A2, and B1	.24
	Within Groups	56048,4	119	471				
RF-A	Between Groups	853.6	4	213.4	4.643	.00*	-B2 > A1, A2, and B1	.135
	Within Groups	5423.1	118	45.96				
WF-T	Between Groups	2176.4	4	544.1	6.229	.00*	-B2 > A1, A2, and B1	.17
	Within Groups	10568.3	121	87.3				
WF-S	Between Groups	3438.405	4	859.601	11.776	.00*	-B1>A1 -B2 > A1, A2, and B1	.28
	Within Groups	8832.452	121	72.995				
WF-A	Between Groups	9508.136	4	2377.034	13553	.00*	-B1>A1 and A2 -B2>A1 and A2	.31
	Within Groups	20695.336	118	175.384				
V-D	Between Groups	18231.703	4	4557.926	26.866	.00*	-All>A1 -B2 and C1>A2	.47
	Within Groups	20528.011	121	169.653				
V-T	Between Groups	55551.168	4	13887.79	20.536	.00*	-B2, C1>B1 -A2, B2, and C1>A1 -B2, C1>A2	.40
	Within Groups	81828,705	121	676.27				
TTR	Between Groups	565.573	4	141.393	1.641	.17	-B2, C1>B1	
	Within Groups	10427.458	121	86.177				

p<.05

Table 2 presents the outcomes of one-way ANOVA analyses, illustrating the differences between language proficiency levels across various variables. The analysis unveiled that B2 level students exhibited significantly faster reading speeds ($F_{(4\text{-}119)}$=9.613, p<.05) and higher reading accuracy ($F_{(4\text{-}118)}$=4.643, p<.05) compared to A1, A2, and B1 levels. The effect sizes for these differences were substantial (η^2=0.24) and moderate (η^2=0.135), respectively.

Concerning writing fluency, B2 level students composed significantly longer texts than A1, A2, and B1 levels ($F_{(4\text{-}121)}$=6.229, p<.05), with a considerable effect size (η^2=0.17). Moreover, B2 level students produced a significantly greater total number of accurate words compared to A1, A2, and B1 levels, while B1 students outperformed A1 ($F_{(4\text{-}121)}$=11.776, p<.05), with a substantial effect size (η^2=0.28).

Additionally, B2 and B1 level students demonstrated significantly higher accuracy percentages in their writing compared to A1 and A2 ($F_{(4-118)}$=13.553, p<.05), with a substantial effect size (η^2=0.31).

In the realm of vocabulary, A1 students employed significantly fewer different words than all other groups, and A2 students used fewer different words than B2 and C1. Furthermore, B1 students used fewer different words than B2 and C1 ($F_{(4-121)}$=26.866, p<.05), with a notable effect size (η^2=0.47). Regarding the length of written texts, A1 students composed shorter texts than A2, B2, and C1, and A2 students wrote shorter texts than B2 and C1. Additionally, B1 students wrote shorter texts than B2 and C1 (η^2=0.40). In terms of the types/token ratio, no significant differences were observed between groups ($F_{(4-121)}$=1.641, p>.05).

In the correlation analysis, there were many significant findings. In the realm of reading fluency, a positive correlation was observed between reading speed and reading accuracy across all proficiency levels, with the correlation coefficients ranging from r=.553 to r=.65, except for the C1 level. When considering all proficiency levels together, a positive correlation persisted between these variables, yielding an overall correlation coefficient of r=.653.

Regarding writing fluency, a consistent absence of correlation was identified between total words and accuracy (in percentage). However, a positive correlation was noted between total words and the speed across all proficiency levels, except for the B2 level, with correlation coefficients changing from r=.951 to r=.786. Furthermore, a positive correlation between accuracy (in percentage) and the speed was observed in the A2, B1, and B2 levels. When aggregating data from all levels, the speed exhibited correlations with both total words (r=.881) and accuracy (in percentage) (r=.498), while total words and accuracy (in percentage) were not correlated.

In the vocabulary domain, different words and total words displayed positive correlations across all proficiency levels, with correlation coefficients changing from r=.869 to r=.713. The correlation between different words and types/token ratio was observed solely in the A2 group (r=.436). Additionally, a negative correlation was identified between total words and types/token ratio in the A2 (r=-.376), B2 (r=-.779), and C1 (r=-.77) levels. When considering all proficiency levels collectively, total words exhibited positive correlations with both different words (r=.874) and types/token ratio (r=-.338).

Reading speed exhibited positive correlations with total words and the speed in A1 (r=.621; r=.723) and A2 (r=.505; r=.569) groups. For B1 (r=.385) and B2 (r=.381) groups, reading speed was correlated solely with the speed. In C1, no significant correlations were identified. When considering all groups collectively, reading speed was correlated with both total words (r=.531) and the speed (r=.469). However, the accuracy in writing did not show any significant correlation with reading speed.

Reading accuracy correlated positively with speed in writing in A1 (r=.449), speed and accuracy (in percentage) in writing in A2 (r=.452; r=.53), and B1 (r=.386; r=.388). However, no significant correlations were observed between reading accuracy and any writing fluency measures in B2 and C1 groups. When analyzing data from all groups together, reading accuracy correlated positively with total words (r=.357), speed (r=.484), and accuracy (r=.352) in writing.

Reading speed correlated positively with different and total words in A1 (r=.548; r=.409) and B1 (r=.363; r=.401) groups. When all groups were considered together, it correlated with different (r=.357) and total words (r=.35). However, types/token ratio in vocabulary did not show any significant correlations with reading speed.

Reading accuracy correlated positively with different (r=.632) and total words (r=.441) only in the A1 group. When considering all groups together, it correlated with different (r=.391) and total words

(*r*=.334). Similar to reading speed, types/token ratio in vocabulary did not demonstrate any significant correlations with reading accuracy.

Total words in writing correlated positively with total words (*r*=.595) and types/token ratio in vocabulary (*r*=.-481) in B2. No significant correlations were identified in other groups. When considering all groups together, it correlated with different (*r*=.388) and total words (*r*=.406) in vocabulary.

The speed in writing exhibited correlations with different (*r*=.53) and total words (*r*=.41) in vocabulary in A1; different words (*r*=.377) in A2; and in B2, it correlated with different (*r*=.491), total (*r*=.651), and types/token ratio (*r*=.-515) in vocabulary. When considering all groups together, it correlated with different (*r*=.54) and total words (*r*=.487) in vocabulary.

Writing accuracy (in percentage) demonstrated a significant correlation only in B1 with different (*r*=.662) and total words (*r*=.514). When considering all groups together, it correlated with different (*r*=.397), total (*r*=.267), and types/token ratio (*r*=.215) in vocabulary.

In summary, these findings provide valuable insights into the complex relationships between reading fluency, writing fluency, and vocabulary across different proficiency levels.

4. Discussion

This study aims to examine reading fluency (speed and accuracy), writing fluency (total words, speed, and the accuracy), and vocabulary (different words, total words, and type/tokens ratio) in Turkish as a foreign language learners across A1 to C1 proficiency levels. Correlational analyses, including Pearson and Spearman Brown methods, were conducted to explore relationships between variables within language-level groups and across all proficiency levels.

Participants demonstrated a relatively slow reading pace at their respective language levels (A1: 63.6 words; A2: 56.6 words; B1: 56.8 words; B2: 84.3 words; C1: 67.4 words), with an overall group mean of 65.8 words per minute. This suggests that, collectively, participants read at a pace comparatively slower than fourth-grade native Turkish speaker students (Akyol et al., 2014).

A1 and A2 participants notably read texts at a frustration level (A1: 89.2%; A2: 87.7%), potentially impeding their comprehension. Conversely, other proficiency groups read texts at an instructional level, indicating an appropriate level of difficulty for comprehension (Rasinski, 2010). When considering all participants together, the mean accuracy was 91.2, indicative of a frustration level.

A review of existing literature reveals consistent findings. Students reading in a foreign language at secondary and university levels perform well in reading comprehension given sufficient time for tests. However, their reading speed typically ranges from 70 to 120 words per minute, approximately half or one-third the speed of native language students (Beglar, Hunt, and Kite, 2012; McLean, and Rouault, 2017; Yoshizawa, Takase, and Otsuki, 2018). Jeon's (2012) study identified L2 students in the 10th grade reading aloud at a rate of 62.5 words per minute, placing them at a level equivalent to 2nd-grade L1 students. This underscores the considerable need for L2 students to engage in reading fluency practice. The complexity of reading fluently in a foreign language arises from additional cognitive demands, such as recognizing foreign vocabulary, grammar, and syntax, necessitating more time and effort. Consequently, unfamiliarity with the foreign language's vocabulary and grammar can impede the reading process, diminishing word recognition and reading speed.

In the context of writing fluency, participants engaged in a two-minute fast-writing activity, demonstrating varying speeds across language proficiency levels. The A1 group produced 19.9 words, including errors, while the A2 group wrote 22.1 words. The B1 group generated 23.3 words, the B2

group 31.3 words, and the C1 group 25 words. The mean across all groups was 24.4 words in two minutes. When considering speed, A1 students produced 13.8 words, A2 students 15.3 words, and the speeds for B1, B2, and C1 were 20, 27.7, and 20.5 words, respectively. The overall mean for speed was 19.6 words. Accuracy, defined as the proportion of accurate words to total words, varied among proficiency levels: 70% in A1, 69.7% in A2, 85.2% in B1, 87.8% in B2, and 81.3% in C1. Combining all groups, the overall accuracy was 78.8%.

Assuming an average word length of 4-5 letters in Turkish, it can be inferred that A1, A2, B1, and C1 students learning Turkish as a foreign language write approximately 40-50 letters per minute. This aligns with the performance of native English-speaking third-grade students engaged in a copying task. Notably, B2 students approached the fourth-grade level in the letter criterion, as observed in texts written by native English speakers in their own language (Graham et al., 1998). However, participants in this study, particularly C1 students, appeared comparatively weaker than those in other studies. For instance, in a study by Baştürk and Bilge (2022), C2-level Turkish learners wrote 162 syllables in total, with 147 syllables accurately written in one minute. Assuming a hypothetical word consists of 3 syllables, this corresponds to an average of 54 words, 49 of which were correct. In contrast, the word count in the present study is notably lower than that of C2-level learners. The writing fluency measurements in this study were based on two-minute writing processes. When adjusted to a one-minute scale, C1 students wrote 12.5 words in total and 10-11 words accurately, suggesting a potential lag in writing fluency compared to C2 students. Surprisingly, B2 students wrote 15.5 words in total and 14 words accurately, exhibiting a faster writing pace than C1 students, contrary to expectations. This unexpected difference may be attributed to the smaller number of participants in C1 or influenced by the participants' diverse L1 language backgrounds, as L1 has been found to impact writing fluency (Phuoc and Barrot, 2022). The range of L1 diversity among participants in the current study surpasses that in Baştürk and Bilge's (2022) study.

It is postulated that students write faster with fewer errors as they become more proficient in a foreign language (Wolfe-Quintero et al., 1998). Tables 1 and 3 indicate that, as Turkish learners gain proficiency, they exhibit increased writing speed and accuracy. With the exception of C1, students demonstrate enhanced speed and accuracy with greater experience in the Turkish language. However, the B2 level appears to represent a critical phase, as students at this level exhibit a significant and dramatic increase in writing speed compared to other proficiency levels (A1-B1).

In conclusion, students appear to produce approximately 5 misspelled or somewhat erroneous words out of 24 words in a two-minute writing activity. With the exception of C1, greater language experience corresponds to increased accuracy in word usage and faster writing.

In the domain of vocabulary, A1 students exhibited an average use of 41.5 different words during a 30-minute end-of-term writing exam. The A2 group utilized 55 words, B1 employed 53.5 words, B2 demonstrated a usage of 74.9 words, and C1 employed 70.2 different words. Collectively, the entire group employed an average of 58 different words in the end-of-term writing exam.

Regarding the text length in the end-of-term exam, A1 students composed 73 words, A2 wrote 94.4, B1 utilized 86.3, B2 demonstrated a usage of 127.1 words, and C1 employed 127.6 words. When considering all students together, the average text length was 98.7 words. However, it is imperative to acknowledge that students had varying at-least-word-limits based on their language level groups in the end-of-term writing exam. Therefore, the length of the written texts may be influenced not only by language experience but also by the rules of the writing exam at the end of the term.

The type/tokens ratio was 57.2 for A1 students, 59.2 for A2 students, 62.8 for B1, 60.5 for B2, and 56.8 for C1 group. The overall average for all participants was 59.8, suggesting an approximate 60% mean of type/tokens ratio.

In comparison with prior studies (Göçen, 2016; Serin, 2017), the students in this study displayed a notably higher variety of words and a types/tokens ratio in the same language proficiency groups compared to their peers in other studies. However, they exhibited a relatively lower total word count. This discrepancy in total words may be attributed to the use of students' exam papers as the data collection tool in this study. The duration of exams for the students in this study was shorter than the composition writing durations in other studies, potentially leading to lower total word counts. The variance in different words and types/tokens ratio may be attributed to the length of the texts, as an increase in text length often correlates with a decrease in the ratio of different words (Bilge and Demirel, 2022).

Participants underwent a comprehensive analysis based on their language proficiency levels (A1 to C1) across all variables. Notably, B2-level students demonstrated superior reading fluency, exhibiting faster (η^2=.24) and more accurate (η^2=.135) reading capabilities compared to A1, A2, and B1 groups. This result underscored the advanced reading skills of B2-level students, aligning with instructional expectations for their language level. Surprisingly, A1 students exhibited faster reading speeds than A2 and B1, though the difference was not statistically significant. Contrary to expectations, there was no proportional increase in reading accuracy with increasing language experience, challenging the anticipated trajectory set by grade-level fluency standards for native speakers (Akyol et al., 2014).

Examining writing fluency, B2-level students outperformed A1, A2, and B1 groups, producing longer texts in a two-minute fast-writing activity. This suggests that B2 students, including misspelled and erroneous words, composed text at a faster pace compared to their peers at lower language levels. The analysis of writing speed revealed that B2 students wrote faster than A1, A2, and B1, with B1 surpassing A1, although not significantly. Additionally, B1 and B2 groups demonstrated higher accuracy in the proportion of speed to total words compared to A1 and A2. Unlike reading fluency, writing fluency variables exhibited more pronounced differences between language proficiency levels. Furthermore, with the exception of C1, it was observed that writing fluency improved with increasing language proficiency. This suggests that writing fluency plays a more distinctive role in language experience compared to reading fluency.

In the realm of vocabulary, all groups, except A1, utilized a greater variety of words, with B2 and C1 surpassing A2 and B1. Regarding the length of written texts in a formal exam, A2, B2, and C1 groups produced longer texts than A1, while B2 and C1 exceeded A2 and B1 groups. In terms of the type/tokens ratio, no significant differences were observed between groups. The results indicate that, as language experience increases, written texts exhibit greater lexical diversity and length. However, caution is warranted as text length may be influenced by exam instructions, particularly varying minimum word limits based on language proficiency levels. Notably, the type/tokens ratio, indicating the ratio of different words to the total number of words, remained around 60% across all groups, with no significant differences. This implies that the type/tokens ratio may not be closely linked to language experience, while the use of diverse words could serve as a crucial indicator.

These findings align with prior research on Turkish as a foreign language, revealing distinctions in language skills among different proficiency levels (Aksoy, 2020; Göçen, 2016; Serin, 2017). Notably, vocabulary emerged as a key discriminator among proficiency levels. Following vocabulary, writing fluency exhibited more frequent and notable differences between groups compared to reading fluency. This distinction may be attributed to the inherent difficulty of writing as a skill, with foreign language learners facing challenges in transferring first language writing skills to the target language (Carson et al., 1990). Thus, the more pronounced differences in writing fluency underscore its role as a better discriminative indicator in foreign language learning compared to reading.

A noteworthy observation is that Level B, particularly B2, appears to represent a stage where a relatively significant leap occurs in language skills compared to the preceding language groups. B2 students demonstrated substantial improvements in various language skills, including reading fluency, writing fluency, and vocabulary. This suggests that specific language levels can serve as pivotal points for the development of certain language skills. The data indicates that language skills become more proficient in tandem with the language proficiency group, with a significant relationship identified between time spent in a foreign country and the grammar, vocabulary, and writing skills of students learning the language (Aksoy, 2020). As language experience accumulates, proficiency increases, with vocabulary showing the earliest gains, followed by writing and then reading skills.

The study undertook an examination of the relationships among variables within language groups and collectively across all groups. Correlational analysis revealed a consistent and statistically significant correlation between reading speed and reading accuracy within language groups, with the exception of the C1 group, as well as when considering all language proficiency levels together. This finding is consistent with studies in both foreign language learning (Baştürk and Bilge, 2022) and mother tongue contexts (Baştuğ and Akyol, 2012; Katzir et al., 2012). Therefore, faster readers tend to read more accurately, which probably lead to better comprehension (Rasinski, 2010).

In writing fluency, a positive correlation was identified between total words and the speed, with the sole exception being the B2 group. Furthermore, a correlation was established between the speed and accuracy (proportion) in writing fluency across the majority of language proficiency groups. However, no correlation was observed between total words and accuracy. Similar to prior research (Baştürk and Bilge, 2022), in foreign language acquisition, writing speed strongly correlates with total words, indicating that faster writers tend to produce longer texts. Faster writers also exhibit greater accuracy. However, the total words in fast-writing activities do not correlate with writing accuracy, suggesting that individuals with varying accuracy levels produce similar total word counts. This highlights that expedited writing is associated with generating more accurate and longer texts in a condensed timeframe. Nevertheless, it is not universally valid that longer texts equate to qualitatively superior writing, as seen in this study, where a predominant association with high accuracy was observed. Therefore, writing fluency, encompassing both speed and accuracy, emerges as a pivotal variable in foreign language writing.

In the realm of vocabulary analysis, a positive correlation was observed between different words and total words across all analyses, with a noteworthy negative correlation between total words and the types/tokens ratio evident in four out of six analyses. Specifically, the negative correlation between total words and the types/tokens ratio implies that as the length of texts increases, the diversity of words tends to decrease in a majority of the analyses. Notably, a positive correlation between different words and the types/tokens ratio was detected solely within the A2 group. These findings parallel the outcomes of prior research (Aksoy, 2020; Bilge and Demirel, 2022; Kılıç, 2019; Milton and Alexiou, 2009). Consequently, it can be posited that individuals with a more extensive and varied vocabulary tend to compose longer texts, the diversity of words diminishes as texts lengthen, and there exists no substantial relationship between the number of different words and the type/tokens ratio.

The examination of reading fluency in relation to writing fluency in the foreign language learning process revealed notable correlations. Specifically, reading speed demonstrated a consistent correlation with speed in writing fluency across all language levels, with the exception of the C1 analysis. Moreover, reading speed exhibited correlations with total words in writing for A1, A2, and the entire participant cohort. Conversely, reading speed displayed no significant correlation with writing accuracy in any analysis. Consequently, it appears that reading speed is primarily associated with writing speed within language-level groups and with the total number of words early in the foreign language learning process, as well as when all levels are amalgamated. In contrast, reading accuracy demonstrated consistent

correlations with speed in writing. Notably, it correlated with writing accuracy (proportion) for the A2 and B1 groups, as well as when all groups were considered collectively. In the comprehensive analysis of all participants, reading accuracy exhibited correlations with all variables pertaining to writing fluency.

In summation, a correlation exists between reading fluency and writing fluency in the context of foreign language learning. Particularly, when all language levels are amalgamated, reading fluency and writing fluency are notably interconnected. Faster readers tend to write more swiftly, although this propensity does not necessarily translate to enhanced writing accuracy compared to their slower counterparts. Considering the established correlation between speed and accuracy in writing fluency (see Appendicies), it is apparent that writing speed and writing accuracy involve distinct cognitive processes. While writing speed exhibits a correlation with reading speed, writing accuracy does not seem to correlate with reading speed, underscoring the divergence in cognitive processes required. Furthermore, individuals with heightened reading accuracy demonstrate a proclivity for faster writing, albeit subject to fluctuations based on language experience. The correlation observed between reading accuracy and writing accuracy persists across various stages of language learning and when all language level groups are amalgamated. This alignment with prior research findings (Baştürk and Bilge, 2022; Johansson and Rijlaarsdam, 2023) supports the contention that reading and writing skills may exert mutual influence. Nonetheless, it is imperative to recognize that the relationship between reading and writing may manifest differently across diverse languages (Carson et al., 1990).

Reading speed exhibited correlations with both different words and total words in vocabulary for A1, B1, and when all groups were combined. However, no significant correlation was observed with the type/tokens ratio. Similarly, reading accuracy was correlated with different words and total words in vocabulary for A1 and the overall participant group, but no correlation was found with the type/tokens ratio. These results align with a previous study conducted with C2-level Turkish learners (Baştürk and Bilge, 2022), suggesting a general lack of correlation between reading fluency and vocabulary in Turkish learners. In contrast, studies with English as a foreign language students have indicated positive correlations between vocabulary and reading (Karakoç, 2016; Stæhr, 2008) as well as reading comprehension (Qian, 1999). This disparity may stem from language differences, as distinct linguistic characteristics can impact language skill acquisition (Godde et al., 2020), and linguistic variations are expected to influence correlations among language skills (Hengeveld and Leufkens, 2018).

Turning to the relationship between writing fluency and vocabulary, positive correlations were found between the total number of words in writing and the total number of words in vocabulary, specifically in the B2 group. Additionally, this measure in writing was negatively correlated with the type/tokens ratio. When all language level groups were considered together, the total number of words in writing exhibited significant correlations with both the number of different words and the total number of words in vocabulary.

Speed in writing demonstrated significant correlations with the number of different words in vocabulary for A1, A2, and B2 groups, as well as when all groups were amalgamated. Moreover, speed in writing fluency exhibited a significant correlation with the total number of words in vocabulary in A1 and B2, and again when all groups were collectively considered. On the other hand, accuracy in writing correlated with the number of different and total words in vocabulary solely in group B1. When all groups were pooled together, it displayed a significant relationship with all vocabulary variables.

In summary, there appears to be a more frequent correlation between writing and vocabulary compared to the relationship between reading and vocabulary. However, this correlation primarily involves speed in writing and the number of different words in vocabulary. Therefore, it can be posited that a broader vocabulary is associated with writing speed. This discovery aligns with findings in both Turkish as a

foreign language learning (Aksoy, 2020; Kılıç, 2019) and EFL contexts (Karakoç, 2016; Stæhr, 2008; Tömen, 2016). It is noteworthy that the correlation between writing fluency and vocabulary may vary across languages (Johansson and Rijlaarsdam, 2023). However, it is clear that vocabulary increase would help foreign language learners to be more fluent writers.

In general, it is observed that reading fluency exhibits more frequent correlations with writing fluency than with vocabulary, particularly up to the B1 level, and these correlations may diminish as language experience increases. However, when all language levels are amalgamated into a single group, reading fluency maintains clear and significant relationships with both writing and vocabulary. This observation aligns with studies suggesting that the interplay between language skills can evolve with heightened language experience (Agustin Llach, 2010; Tömen, 2016).

Writing fluency demonstrates slightly distinct patterns compared to reading fluency. Within writing fluency, speed manifests as the variable with the most robust correlation with vocabulary. Hence, proficiency in rapidly and accurately generating words appears especially tied to a diverse lexicon. Furthermore, when all participants are regarded as a unified group, all writing fluency variables exhibit significant relationships with vocabulary, except for the type/tokens ratio. This highlights a closer association between writing fluency and vocabulary in foreign language learning, potentially explained by the study's measurement of generative vocabulary.

Regarding vocabulary, it can be asserted that the utilization of different words and the composition of lengthier texts more frequently relate to writing fluency. Notably, the number of different words exhibits the most prevalent relationship with both writing fluency and reading fluency, underscoring the significance of productive vocabulary in foreign language literacy. The collective relationship between vocabulary, writing- and reading fluencies emphasizes the pivotal role of vocabulary and the ability to produce extended texts in foreign language acquisition.

When all language levels are considered collectively, language skills exhibit clearer correlations compared to an analysis conducted on a group-by-group basis. The highest number of correlations is evident when language levels are collectively examined, and few variables display a lack of correlation in this context, such as the types/tokens ratio in vocabulary. This suggests robust interconnections among language skills in foreign language learning, even when correlations are not consistently observed at specific language levels.

Moreover, it is intriguing to note that certain variables show limited or no correlation with others in this study. For instance, in vocabulary, the type/tokens ratio lacks correlation with reading fluency, while it exhibits a minimal correlation with writing fluency. This indicates that the type/tokens ratio may not be readily predicted by other language skills in the context of language teaching.

Previous research has consistently demonstrated a significant correlation between reading and writing fluency (Johansson and Rijlaarsdam, 2023), variations in these correlations across different language groups (Carson et al., 1990), and an increase in these correlations with heightened language experience (Agustin Llach, 2010). However, in the current study, although significant correlations were identified between reading fluency and writing fluency, there was no observed escalation in these correlations with advancing language experience or levels (A1, A2, etc.). This suggests a potential language-to-language variation in the dynamics of relationships between language skills. Considering the influence of the first language on the second or foreign language acquisition (Carson et al., 1990; Johansson and Rijlaarsdam, 2023; Memiş, 2019), it becomes evident that formulating generalized rules or determinations regarding these relationships may be challenging and unnecessary. Hence, the unique patterns of each language in foreign language learning should be acknowledged and explored.

The study yields several practical recommendations for educators. Notably, it was observed that Turkish as a foreign language learners exhibited weaknesses in reading skills. To address this, practitioners may implement extensive reading strategies (Iwahori, 2008) and repeated reading activities (Taguchi et al., 2012) to enhance reading fluency among students. Additionally, considering the identified weaknesses in writing fluency skills, it is advisable to employ diverse methods (Chenoweth and Hayes, 2001; Hayes, 2009) aimed at improving writing speed.

Given the evident correlation between vocabulary and both reading fluency and writing, fostering vocabulary development is crucial. In this context, instructors may consider incorporating instructional approaches focused on teaching construction suffixes, which have been shown to enhance students' vocabulary (Memiş, 2019).

For researchers, exploring diverse correlations by incorporating additional dimensions into the investigation of writing and reading skills is recommended. This may involve examining correlations between higher-level processes, such as the appropriateness of writing for a target audience and reading comprehension. Expanding participant numbers can contribute to unveiling more nuanced relationships and structures, particularly in advanced analyses like Structural Equation Modeling (SEM). Moreover, when investigating such relationships, grouping participants based on their mother tongue may yield insightful findings.

The present study is subject to several limitations that should be acknowledged. Primarily, the participant pool is relatively small, particularly at the advanced C1 level, due to limitations within the data collection organization. This scarcity of participants, particularly at higher proficiency levels, may hinder the execution of advanced analyses such as regression. Furthermore, the study's reading, writing, and vocabulary data were derived from single-session measurements, potentially limiting the ability to capture participants' comprehensive language abilities over time.

Additionally, it is important to note that the correlation analyses encompassed a total of 168 comparisons, and no Bonferroni correction was applied. The decision to forego Bonferroni correction was influenced by the concern that implementing it would substantially raise the alpha level, making it exceedingly challenging to identify statistically significant differences. This choice aligns with the practices of previous studies where such correction was omitted, and interpretations were conducted without its application. Despite this, it is essential to acknowledge the potential impact of this choice on the interpretation of the study's findings.

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Appendices

Correlation results of A1 level

	RF-S	RF-A	WF-T	WF-S	WF-A	V-D	V-T	V-TTR
RF-S	X							
RF-A	.65^{s*}	X						
WF-T	.621^{p*}	.33^{s}	X					
WF-S	.723^{p*}	.449^{s*}	.864^{p*}	X				
WF-A	.304^{p}	.191^{s}	.03^{s}	.37^{s}	X			
V-D	.548^{p*}	.632^{s*}	.35^{s}	.53^{s*}	.35^{s}	X		
V-T	.409^{s*}	.441^{s*}	.31^{s}	.41^{s*}	.23^{s}	.843^{s*}	X	
V-TTR	.232^{p}	.352^{s}	.21^{p}	.34^{p}	.29^{s}	.32^{s}	-.15^{s}	X

Correlation results of A2 level

	RF-S	RF-A	WF-T	WF-S	WF-A	V-D	V-T	V-TTR
RF-S	X							
RF-A	.626^{s*}	X						
WF-T	.505^{s*}	.24^{p}	X					
WF-S	.569^{s*}	.452^{p*}	.786^{p*}	X				
WF-A	.06^{s}	.53^{p*}	-.11^{p}	.508^{p*}	X			
V-D	.14^{s}	.19^{s}	.16^{p}	.377^{p*}	.35^{p}	X		
V-T	.19^{s}	.21^{s}	.22^{p}	.28^{p}	.04^{p}	.713^{p*}	X	
V-TTR	-.12^{s}	.16^{p}	-.02^{p}	.08^{p}	.19^{p}	.436^{p*}	-.376^{p*}	X

Correlation results of B1 level

	RF-S	RF-A	WF-T	WF-S	WF-A	V-D	V-T	V-TTR
RF-S	X							
RF-A	.553^{p*}	X						
WF-T	.3^{p}	.25^{p}	X					
WF-S	.385^{p*}	.386^{p*}	.919^{p*}	X				
WF-A	.25^{S}	.388^{s*}	.21^{s}	.511^{s*}	X			
V-D	.363^{p*}	.22^{p}	.11^{p}	.33^{p}	.662^{s*}	X		
V-T	.401^{p*}	.02^{p}	.05^{p}	.22^{p}	.514^{s*}	.842^{p*}	X	
V-TTR	-.07^{p}	.13^{p}	.06^{p}	.2^{p}	.19^{s}	.23^{p}	.-31^{p}	X

Correlation results of B2 level

	RF-S	*RF-A*	*WF-T*	*WF-S*	*WF-A*	*V-D*	*V-T*	*V-TTR*
RF-S	*X*							
RF-A	*.616^{p*}*	*X*						
WF-T	*.3^{p}*	*.35^{s}*	*X*					
WF-S	*.381^{p*}*	*.3^{p}*	*.2^{p}*	*X*				
WF-A	*.14^{p}*	*.28^{p}*	*.3^{p}*	*.39^{p*}*	*X*			
V-D	*.21^{p}*	*.18^{p}*	*.42^{p}*	*.491^{p*}*	*.17^{p}*	*X*		
V-T	*.32^{p}*	*.28^{p}*	*.595^{p*}*	*.651^{p*}*	*.12^{p}*	*.791^{p*}*	*X*	
V-TTR	*-.22^{p}*	*.-27^{p}*	*.-481^{p*}*	*.-515^{p*}*	*.05^{p}*	*.-34^{p}*	*.-779^{p*}*	*X*

Correlation results of C1 level

	RF-S	RF-A	WF-T	WF-S	WF-A	V-D	V-T	V-TTR
RF-S	X							
RF-A	.53^{s}	X						
WF-T	.58^{s}	.46^{s}	X					
WF-S	.59^{s}	.60^{s}	.951^{s*}	X				
WF-A	.23^{s}	.12^{s}	.23s	.37^{s}	X			
V-D	.41^{s}	.-32^{s}	.42^{s}	.31^{s}	.23^{s}	X		
V-T	.46^{s}	.-31^{s}	.55^{s}	.45^{s}	.29^{s}	.869^{s*}	X	
V-TTR	.-25^{s}	.25^{s}	.-56^{s}	.-51^{s}	.-21^{s}	.-42^{s}	.-77^{s*}	X

Correlation results of all groups

	RF-S	RF-A	WF-T	WF-S	WF-A	V-D	V-T	V-TTR
RF-S	X							
RF-A	.653^{s*}	X						
WF-T	.531^{p*}	.357^{s*}	X					
WF-S	.469^{p*}	.484^{s*}	.881^{p*}	X				
WF-A	.13^{p}	.352^{s*}	.12^{p}	.498^{p*}	X			
V-D	.357^{p*}	.391^{s*}	.388^{p*}	.54^{p*}	.397^{p*}	X		
V-T	.35^{p*}	.334^{s*}	.406^{p*}	.487^{p*}	.267^{p*}	.874^{p*}	X	
V-TTR	.-13^{p}	.09^{s}	-.03^{p}	.07^{p}	.215^{p*}	.08^{p}	-.338^{p*}	X

General table of significant correlations

		A1	A2	B1	B2	C1	All Groups
Within variables							
RF		S-A	S-A	S-A	S-A	-	S-A
WF		T-S	T-S; S-A	T-S; S-A	S-A	T-Ac	T-S; T-A; S-A
V		D-T	D-T; D-P; T-P*	D-T	D-T; T-P*	D-T; T-P*	D-T; T-P*
Between Variables							
RF-S	WF	Wf-T; Wf-S	Wf-T; Wf-S	Wf-S	Wf-S	-	Wf-T; Wf-S
RF-A	WF	Wf-S	Wf-S; Wf-A	Wf-S; Wf-A	-	-	Wf-T; Wf-S; Wf-A
RF-S	V	V-D; V-T	-	V-D; V-T	-	-	V-D; V-T
RF-A	V	V-D; V-T	-	-	-	-	V-D; V-T
WF-T	V	-	-	-	V-T; V-TTR*	-	V-D; V-T
WF-Ac	V	V-D; V-T	V-D	-	V-D; V-T; V-TTR*	-	V-D; V-T
WF-A	V	-	-	V-D; V-T	-	-	V-D; V-T; V-TTR
WF-T	RF	R-S	R-S	-	-	-	R-S; R-A
WF-S	RF	R-S; R-A	R-S; R-A	R-S; R-A	R-S	-	R-S; R-A
WF-A	RF	-	R-A	R-A	-	-	R-A

V-D	RF	R-S; R-A	-	R-S	-	-	R-S; R-A
V-T	RF	R-S; R-A	-	R-S	-	-	R-S; R-A
V-P	RF	-	-	-	-	-	-
V-D	WF	Wf-S	Wf-S	Wf-A	Wf-S	-	Wf-T; Wf--S; Wf-A
V-T	WF	Wf-S	-	Wf-A	Wf-T; Wf-S	-	Wf-T; Wf-S; Wf-A
V-P	WF	-	-	-	Wf-T*; Wf-S*	-	Wf-A

*:negative direction