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Syntactic Complexity in Pakistani L2 Academic Writing: A Review-Based Study

Research Article

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Abstract

This review synthesizes research comparing syntactic complexity in Pakistani L2 academic writing with other contexts. We aimed to identify key features, benchmark methods, and assess the roles of language, pedagogy, and proficiency. Analyzing empirical studies using quantitative indices and corpus tools, we find that first language and educational context strongly shape Pakistani L2 syntax. Methodological issues persist, especially with automated tools across proficiency levels. Disciplinary variation in Pakistani writing is often less distinct than international norms. Higher proficiency correlates with more complex syntax, but longitudinal data is scarce. Targeted instruction shows promise but needs more testing. Overall, the findings highlight a complex mix of linguistic, educational, and disciplinary factors. We call for integrated methods and longitudinal research to improve assessment, curriculum, and instruction for Pakistani L2 academic writers.

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1. Introduction

Research comparing syntactic complexity in Pakistani L2 writing with other contexts is crucial for assessment, pedagogy, and global academic standards (Khushik, 2024; Yang, Yap, & Ali, 2022). The field has moved from analyzing isolated features to multidimensional approaches (Ai & Lu, 2013; Khushik & Huhta, 2020). As English becomes academia's lingua franca, with most writers being non-native, this work is socially and theoretically significant (Hernandez, 2022; Williams, 2023). For example, advanced Pakistani academic writing shows distinct patterns that diverge from native norms, demanding context-sensitive methods (Ahmad, Mahmood, Siddique, Imran, & Almusharraf, 2024; Azher, Faiz, Izhar, Nisa, & Ali, 2019).

The core problem is understanding how and why Pakistani L2 syntactic complexity differs from other contexts (Khushik, 2025; Wang et al., 2023). A major gap exists in understanding how L1 influence, pedagogy, and disciplinary norms interact (Ahmad, Mahmood, & Siddique, 2023; Khushik, 2022; Ullah, Chaudhary, & Bukhari, 2025). Some argue differences come from L1 transfer, others from teaching methods (Khushik, 2024, 2025). This confusion hurts practice, hindering effective curriculum design for Pakistani learners (Ahmad, Mahmood, & Siddique, 2025).

Our framework defines syntactic complexity as the range and sophistication of structures, shaped by L1 and education (Yang et al., 2022; Biber et al., 2025). We use multidimensional analysis of clausal and phrasal complexity, subordination, coordination, and unit length (Azher et al., 2019; Perez-Guerra & Smirnova, 2023). This helps us compare Pakistani L2 writing to others (Hernandez, 2022; Zhang & Cui, 2023).

This review synthesizes empirical findings to identify patterns, influences, and pedagogical implications (Khushik, 2024; Yang et al., 2022). Our goal is to inform teaching, assessment, and policy to improve Pakistani learners' academic writing (Azher et al., 2019; Hafeez & Aziz, 2025).

We used a corpus-based method, reviewing peer-reviewed studies that use automated complexity tools and multidimensional frameworks (Bi & Wang, 2023; Chau & Bulte, 2022). We included comparative studies with Pakistani L2 writers and other groups, organizing findings by linguistic features, proficiency, and discipline (Ahmad et al., 2]023; Pervez, Siddique, & Ahmad, 2024).

This report examines research on comparative syntactic complexity in Pakistani L2 academic writing. It synthesizes current knowledge on how complexity manifests across different L2 contexts, focusing on Pakistani learners. The review is important because it tackles how L1, educational setting, and disciplinary norms affect syntax. By analyzing comparative studies, we identify patterns, divergences, and gaps to inform assessment, curriculum, and targeted teaching for Pakistani L2 writers.

1.1 Objectives

1. Evaluate current knowledge on syntactic complexity features in Pakistani L2 writing compared to other L2 contexts.
2. Benchmark methodologies and tools for measuring complexity across learner populations.
3. Identify cross-linguistic and pedagogical factors affecting complexity in Pakistani and international L2 writing.
4. Compare disciplinary and genre-specific complexity patterns within Pakistani and global academic writing.
5. Deconstruct how proficiency levels and educational backgrounds shape complexity among Pakistani L2 writers.

2. Methodology

We transformed the research question into specific search statements to ensure a comprehensive yet manageable review. This process yielded 53 candidate papers. Backward and forward citation chaining added 110 more papers. Relevance scoring sorted the 163 total papers, identifying 159 as relevant and 50 as highly relevant.

3. Results

3.1 Descriptive Summary

The literature includes diverse empirical studies using quantitative indices, corpus analyses, and automated tools. Comparisons involve Pakistani L2 writers and learners from Finnish, Chinese, Filipino, and Middle Eastern backgrounds. Genres include essays, dissertations, and research articles. Methods integrate multidimensional measures, cross-linguistic assessments, and disciplinary analyses. Key studies show:

1. Khushik (2024) found significant L1 and pedagogy effects between Pakistani and Finnish learners using 14 L2SCA features.
2. Khushik & Huhta (2020) used 28 indices to distinguish CEFR levels A1-B1 across Sindhi and Finnish L1 groups.
3. Ahmad et al. (2024) analyzed clausal and phrasal features across 16 Pakistani disciplines at the doctoral level, suggesting discipline-specific instruction.
4. Aziz et al. (2017) found significant variation between physical and biological sciences in Pakistani doctoral theses.
5. Khushik (2025) showed L1 influence between Finnish and Pakistani EFL learners at A1-B1 levels, with educational context shaping development.
6. Ullah et al. (2025) highlighted L1 transfer effects and proficiency socialization in Pakistani postgraduate writing.
7. Hernandez (2022) found compressed nominal phrases dominate Filipino L2 writing across disciplines.
8. Ai & Lu (2013) showed significant syntactic differences between low and high proficiency NNS and NS university students.

9. Ahmad et al. (2025) found Pakistani doctoral writing below expected advanced stages.
10. Ahmad et al. (2023) found no significant disciplinary variation across four divisions in Pakistani dissertations.
11. Azher et al. (2019) found significant differences across humanities, social sciences, and sciences at the doctoral level.
12. Pervez et al. (2024) found significant linguistic variation across engineering, IT, and literature in Pakistani research article discussions.
13. Qin et al. (2024) highlighted group and individual variability in high school EFL learners.
14. Yang et al. (2022) called for more comparative and qualitative studies.
15. Châu and Bulté (2022) found automated tools less reliable for lower proficiency Dutch L2 learners.
16. Gao and He (2023) found L2 writers use longer dependency distances than L1 writers.
17. Smirnova (2022) found experts use more clausal complexity than learners.
18. Lyu, Chishti and Peng (2022) found significant proficiency differences in Japanese L2 writing.
19. Williams (2023) found weak positive correlations between syntax and proficiency.
20. Zhang and Cui (2023) found a strong relationship between syntactic features and rhetorical stages.
21. Bi and Wang (2022) found phrasal complexity explains differences between Chinese and expert writers.
22. Pérez-Guerra and Smirnova (2023) found soft sciences use more clausal complexity, hard sciences more phrasal.
23. Zheng and Barrot (2024) found argumentative essays show higher coordination and phrasal sophistication.
24. Casal and Lu (2021) found instruction increases awareness and confidence in complexity.
25. Martin (2023) found higher-ranked journals show greater syntactic complexity.

3.2 Syntactic Complexity Indices

30 studies used quantitative measures like length, subordination, coordination, and phrasal sophistication, often with tools like L2SCA, TAASSC, and Coh-Metrix (Khushik, 2024; Khushik & Huhta, 2020). Fine-grained indices like nominal complexity and dependency distance captured nuanced features (Bi & Wang, 2022; Gao & He, 2023). Differences consistently appeared between L1 and L2 writers, across proficiency levels, and disciplines (Ai & Lu, 2013; Lyu et al., 2022; Pérez-Guerra & Smirnova, 2023).

3.3 Cross-Linguistic Influence

12 studies showed clear L1 effects. Pakistani L2 writers show distinct syntactic profiles compared to Finnish, Chinese, Filipino, and Middle Eastern writers (Khushik, 2024; Khushik, 2025; Wang et al., 2023). L1 influence appears in preferences for auxiliaries, adverbials, and nominal modifiers (Hernandez, 2022; Zhang & Kang, 2022). Some research emphasizes the interaction of L1 and pedagogy (Khushik, 2025; Ullah et al., 2025).

3.4 Disciplinary Variation

11 studies investigated disciplinary variation, with mixed results. Some found significant variation, others homogeneity (Ahmad et al., 2023; Ahmad et al., 2024; Aziz et al., 2017). Pakistani academic writing often shows limited disciplinary differentiation compared to international norms (Ahmad et al., 2023). International studies show distinct patterns: soft sciences favor clausal complexity, hard sciences phrasal complexity (Pérez-Guerra & Smirnova, 2023; Smirnova, 2022).

3.5 Proficiency Level Effects

18 studies linked complexity to proficiency. Higher proficiency brings more elaboration and diversity (Khushik & Huhta, 2020). Early stages show less complexity and simpler structures, gradually developing complex nominals and subordination (Williams, 2023). Proficiency effects also link to writing quality and publication success (Martin, 2023).

3.6 Pedagogical and Educational Contexts

10 studies emphasized teaching methods and curriculum design (Khushik, 2024, 2025). Interventions focusing on syntactic complexity awareness show positive effects (Casal & Lu, 2021). ESL vs. EFL settings affects syntactic preferences, with ESL learners producing more readable and flexible syntax (Zhang & Kang, 2022).

3.7 Critical Analysis and Synthesis

The literature shows L1 and educational context strongly shape syntactic development. Automated tools have advanced measurement but have reliability issues, especially with lower proficiency learners. Disciplinary variation in Pakistani writing is inconsistently reported, often showing less differentiation than international norms.

3.7.1 L1 and Educational Context

Studies robustly show L1 and pedagogy shape Pakistani L2 writing (Khushik, 2024, 2025). Weakness: Most studies use limited proficiency levels and cross-sectional designs, restricting generalizability.

3.7.2 Methodologies and Tools

Automated tools (L2SCA, Coh-Metrix, TAASSC) enable large-scale analysis (Khushik, 2024). Weakness: Tools face reliability issues with lower proficiency learners due to parsing errors (Chau & Bulte, 2022). Manual validation is underutilized.

3.7.3 Disciplinary Variation

Pakistani writing shows both heterogeneity and homogeneity (Ahmad et al., 2023, 2024), suggesting writers ignore disciplinary norms. Weakness: International studies show marked differences, suggesting Pakistani writing lags. Corpus sizes and disciplinary breadth are often limited (Ahmad et al., 2023, 2024).

3.7.4 Proficiency Levels

Studies distinguish CEFR levels effectively (Khushik & Huhta, 2020; Khushik, 2025). Weakness: Longitudinal data is scarce (Qin et al., 2023). Most research uses cross-sectional snapshots.

3.7.5 Cross-Linguistic Comparisons

Comparative analyses provide valuable benchmarks (Khushik, 2024; Zhang & Kang, 2022). Weakness: Uneven sample sizes and task prompts confound results. Focus on argumentative essays limits generalizability.

3.7.6 Integration of Approaches

Some studies combine quantitative and qualitative analyses (Hernandez, 2022; Ullah et al., 2025). Weakness: Most research remains quantitatively driven, missing pragmatic and cultural dimensions.

4. Thematic Review

Key themes include L1 and educational context, disciplinary and genre variation, proficiency, and pedagogy. Automated tools have strengths and limitations. Comparative analyses show both unique and shared patterns. Emerging studies call for nuanced instructional strategies.

4.1 Cross-Linguistic and Cultural Influences (13/50)

ESL vs. EFL contexts displays different preferences (Zhang & Kang, 2022).

4.2 Syntactic Complexity Patterns in Pakistani Writing (12/50)

Corpus studies show frequent nouns as pre-modifiers and limited disciplinary variation (Ahmad et al., 2023; Azher et al., 2019). Pakistani writing may lag behind expert norms.

4.3 Syntactic Complexity and Writing Quality (10/50)

Positive correlations exist between complexity measures (e.g., mean clause length, complex nominals) and writing quality. Lexical and syntactic features interact to predict scores (Williams, 2023).

4.4 Nominal Phrase Compression (8/50)

L2 academic writing, including Pakistani and Filipino, uses compressed nominal phrases (attributive adjectives, noun premodifiers), creating dense, implicit structures (Hernandez, 2022).

4.5 Pakistani English as a Distinct Variety (7/50)

Multidimensional analysis reveals significant linguistic variation across disciplines, supporting Pakistani English as a distinct variety. Sciences show more informational, dense nominal styles (Azher et al., 2019; Fatima, Siddique, & Ahmad, 2023; Pervez et al., 2024).

4.6 Comparative Studies Across Countries (7/50)

Comparisons between Pakistani writers and Finnish, Chinese, Indonesian, and Middle Eastern learners highlight common challenges and context-specific features (Khushik, 2024; Martin, 2023).

4.7 Pedagogical Approaches (6/50)

Explicit instruction, awareness-raising, and corpus-informed teaching improve complexity (Casal & Lu, 2021).

4.8 Impact of Publication Standards (3/50)

Higher-ranked journals feature greater syntactic complexity. Pakistani scholars' publication quality may link to syntactic competence (Hafeez& Aziz, 2025; Martin, 2023).

4.9 Dependency Distance (2/50)

L2 writers, including Pakistanis, produce longer dependency distances due to heavier prepositional phrase use (Gao& He, 2023).

5. Chronological Review

2012-2017 (Foundational): Established key measures, compared L1/L2 writing, explored disciplinary variation. Laid groundwork using corpus-based and multidimensional tools.

2019-2020 (Comparative & Developmental): Focused on CEFR levels and L1 influence (Pakistan/Finland). Used L2SCA and Coh-Metrix to quantify complexity across levels.

2021-2022 (Methodological Refinement): Expanded use of automated and manual analyses, addressing reliability. Focus on ESL/EFL comparisons, genre-specific complexity, and rhetorical structures.

2023 (Cross-Contextual): Broadened to multiple L1 backgrounds, proficiency levels, and disciplines. Used advanced metrics (Kolmogorov complexity) and multidimensional analyses.

2024-2025 (Integrative & Pedagogical): Focused on combined effects of L1, education, and pedagogy, especially at lower CEFR levels. Used experimental and corpus-based mixed methods.

6. Agreement and Disagreement across Studies

6.1 Proficiency Level Effects

Most studies agree higher proficiency increases complexity (Khushik & Huhta, 2020; Qin et al., 2023; Wang et al., 2024; Williams, 2023). Divergence: Some find Pakistani advanced writers below expected benchmarks (Ahmad et al., 2023). Explanation: Different operational definitions, populations, and curriculum effects.

6.2 Disciplinary Variation

International studies show clear variation (Pérez-Guerra & Smirnova, 2023). Pakistani studies show mixed results, often limited variation (Ahmad et al., 2023, 2024; Azher et al., 2019). Explanation: Pakistani writers may not internalize disciplinary norms or corpora are too narrow.

6.3 Pedagogical and Educational Contexts

Most studies confirm positive correlations between proficiency and complexity (Khushik & Huhta, 2020). Divergence: Some find EFL learners show higher complexity but lower fluency (Wang et al., 2024). Explanation: Curriculum effects and limited exposure.

7. Theoretical and Practical Implications

7.1 Theoretical Implications

i. Complexity is multidimensional, shaped by L1, proficiency, and education (Khushik, 2024, 2025; Zhang & Kang, 2022).

ii. Developmental trajectories are not uniform; L1 and pedagogy modulate development, especially at lower levels (Khushik, 2025; Yang et al., 2022).

iii. Limited disciplinary differentiation in Pakistani writing questions the universality of disciplinary norms in L2 contexts (Ahmad et al., 2023, 2024; Azher et al., 2019).

iv. Compressed nominal phrases in L2 writing diverge from elaborated L1 structures, enriching academic discourse models (Hernandez, 2022).

v. Automated metrics like Kolmogorov complexity show promise for capturing holistic patterns (Wang et al., 2024).

vi. The link between complexity and rhetorical stages supports genre-based and functional theories (Zhang & Cui, 2023).

7.2 Practical Implications

vii. For pedagogy: Explicit instruction in discipline-specific syntactic features and complexity awareness (Casal & Lu, 2021).

viii. For assessment: Use fine-grained indices (e.g., nominal modifiers, dependency distance) for more precise diagnostics (Bi & Wang, 2022; Gao & He, 2023).

ix. For curriculum: Integrate L1-aware and context-sensitive materials, especially for lower proficiency learners.

x. For EAP: Focus on unpacking compressed nominal phrases and adapting to disciplinary conventions.

xi. For publication: Train Pakistani scholars in syntactic features expected by high-ranked journals (Martin, 2023).

7.3 Limitations

Geographic Bias: Focus on Pakistan, Finland, China limits generalizability (Ahmad et al., 2023; Azher et al., 2019; Khushik, 2024; Khushik & Huhta, 2020; Ullah et al., 2025; Zhang & Kang, 2022).

Small Sample Sizes: Constrains statistical power (Châu & Bulté, 2022).

Limited Longitudinal Data: Hinders understanding of developmental trajectories (Qin et al., 2023; Yang et al., 2022).

Overreliance on Automated Tools: Introduces measurement errors, especially with lower proficiency texts (Bi & Wang, 2022; Châu & Bulté, 2022; Khushik, 2024).

Narrow Disciplinary Focus: Limits understanding of cross-disciplinary variation (Ahmad et al., 2023, 2024; Azher et al., 2019; Aziz et al., 2017; Pérez-Guerra & Smirnova, 2023).

Insufficient Control of Confounding Variables: Weakens causal inferences (Khushik, 2024; Zhang & Kang, 2022).

Lack of Qualitative Insights: Overlooks pragmatic and discourse functions (Yang et al., 2022; Zhang & Cui, 2023).

Limited Focus on Lower Proficiency Levels: Restricts insights into early acquisition (Khushik, 2025; Khushik & Huhta, 2020).

Inconsistent Use of Measures: Hinders comparability (Biber et al., 2025; Yang et al., 2022).

Lack of Cross-Linguistic Diversity: Excludes less commonly studied languages (Wang et al., 2024).

7.4 Gaps and Future Research Directions

Longitudinal Studies (High Priority): Track syntactic complexity growth over time in Pakistani L2 writers (Khushik & Huhta, 2020; Qin et al., 2023).

Reliability of Automated Tools (High Priority): Develop or adapt tools for lower proficiency L2 texts; integrate hybrid manual-automated validation (Châu & Bulté, 2022).

Disciplinary Variation (High Priority): Expand corpus size and breadth, including undergraduate levels, to clarify if Pakistani writing aligns with global conventions (Ahmad et al., 2023, 2024; Azher et al., 2019).

Cross-Linguistic Influence (Medium Priority): Conduct comparative analyses with diverse L1 groups and global corpora.

Proficiency & Educational Context Interaction (High Priority): Study how different educational settings and proficiency stages jointly affect complexity, using matched samples (Khushik, 2025; Zhang & Kang, 2022).

Fine-Grained Indices (Medium Priority): Validate and incorporate indices like nominal modifiers and dependency distance; explore their link to writing quality (Bi & Wang, 2022; Gao & He, 2023).

Impact of Journal Ranking (Low Priority): Analyze syntactic complexity differences across journal rankings in Pakistani publications (Martin, 2023).

8. Conclusion

Research on syntactic complexity in Pakistani L2 academic writing highlights the strong influence of L1 and educational environment. Pakistani L2 writers show distinct profiles

shaped by their native languages and pedagogical exposures. These factors interact most clearly at lower proficiency levels, where trajectories diverge from international peers. Automated tools enable large-scale analysis but need careful application, especially with lower proficiency learners.

Disciplinary variation in Pakistani writing is less pronounced than in international contexts. Writers often use similar syntactic patterns across disciplines, unlike global norms where hard and soft sciences show distinct profiles. This homogeneity suggests gaps in discipline-specific instruction.

Higher proficiency brings greater syntactic elaboration and writing quality. However, some evidence suggests Pakistani advanced learners may lag behind expected benchmarks. Complexity also links to rhetorical structure and academic success, emphasizing the need for targeted instruction.

Pedagogically, instruction focused on syntactic complexity awareness works, but more empirical studies are needed. Finally, the field needs more qualitative and mixed-methods research to capture pragmatic, rhetorical, and cultural nuances. Overall, we need longitudinal, interdisciplinary, and context-sensitive research to better support Pakistani L2 academic writers in a globalized academic landscape.

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