

RESEARCH ARTICLE

Exploring the latent structure of reading strategies in the digital era

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ABSTRACT

This study explores the latent structure of digital reading strategies among medium-frequency social media users by integrating three dimensions: reading behavior, interaction patterns, and text characteristics. The study responds to a gap in digital reading research, in which these dimensions are often examined separately even though online comprehension requires simultaneous navigation, evaluation, interaction, and integration of multimodal texts. Anchored in interactive reading theory, the construction-integration model, and the new literacies perspective, the study employed an exploratory quantitative survey involving 226 students of Makassar State University who accessed social media for 1-3 hours per day. The questionnaire measured reading behavior, interaction patterns, and text characteristics, with each dimension represented by 10 statement items. Data were analyzed using exploratory factor analysis (EFA). The results showed a feasible factorization matrix (KMO = 0.664; Bartlett's Test of Sphericity, $p < 0.001$) and produced one latent factor with an eigenvalue of 2.132 that explained 71.07% of the variance. High factor loadings for reading behavior (0.890), text characteristics (0.873), and interaction patterns (0.760) indicate that the three dimensions form a single construct, termed the integrative digital reading strategy model. The findings provide a theoretical basis for confirmatory factor analysis (CFA), instrument refinement, and literacy interventions that strengthen students' strategic, critical, and evaluative engagement with digital texts.

Keywords: Digital reading strategies; reading behavior; interaction patterns; text characteristics.

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INTRODUCTION

Social media is one of the factors that influence reading comprehension skills in the digital era and academic performance (Lacka et al., 2021; Liu et al., 2022). Reading activities in digital spaces demand the ability to navigate, evaluate, and integrate different forms of multimodal information (List & Alexander, 2019). Recent evidence also shows that attentional interference in online environments can reduce reading comprehension because digital reading requires readers to control competing stimuli and maintain focused information processing (Shen, 2025). In social media contexts, users' epistemic beliefs and digital literacy shape how they engage with information, indicating that reading on these platforms is influenced not only by access frequency but also by how users judge, process, and interact with digital content (Puspitasari et al., 2025). In the context of this study, social media users are the focus of the study. Previous studies have reported that medium-frequency social media users have better reading comprehension abilities (Basri et al., 2024; Trinczer et al., 2024). However, previous research has not examined the reading strategies employed by moderate social media users. Therefore, exploration to uncover the reading strategies of moderate social media users through a review of various aspects is urgently needed.

Reading strategies in the digital age are concerned with the way readers navigate, evaluate, and integrate information. This study is focused on mapping the structure of digital reading strategies. Previous research examining reading strategies has focused on the category of strategies (Mokhtari & Sheorey, 2002; Par, 2020), the relationship of metacognitive awareness of reading strategies with reading comprehension (Ghimire & Mokhtari, 2025), the effects of reading strategies (Habók et al., 2024; Subaveerapandiyan & Sinha, 2022), and the model of reading strategies (Rahma et al., 2024; Suparto et al., 2025). Various studies have examined reading behavior (Anggia & Habók, 2024), interaction patterns (Sur & Ünal, 2024; Zhang et al., 2025), and text characteristics (Sedlmayr & Weissenbacher, 2025; Spencer et al., 2019) as factors that affect reading comprehension. However, most studies still examine these three aspects separately. This study attempts to fill this gap by examining them holistically to provide a comprehensive understanding of how reading behavior, interaction patterns, and text characteristics work together.

The integration of these three dimensions can be explained through an interactive model of reading and construction-integration model that places understanding as the result of the construction of meaning through interaction between the reader and the text (Kintsh, 2018). In the digital context, this interaction is mediated by the reader's

operational actions towards the text, so that reading behavior represents cognitive strategies, interaction patterns represent digital navigation mechanisms, and the characteristics of the text function as a linguistic stimulus that is processed. The research gap arises because there has been no study that integrates these three dimensions in a single conceptual framework, especially to explain the phenomenon that medium-frequency social media users show better reading comprehension than users with low and high frequencies. Therefore, this study seeks to fill this gap by examining an integrative digital reading strategy to provide a more comprehensive theoretical and empirical contribution.

The novelty of this study lies in the focus of research that examines reading strategies that include reading behavior, interaction patterns, and text characteristics in social media users with medium frequency. This group of users is interesting to study because it shows better reading comprehension capabilities. Through the Exploratory Factor Analysis (EFA) approach, this study seeks to identify the latent structure of digital reading strategies and examine the simultaneous relationship between reading behavior, interaction patterns, and text characteristics as a representation of the construct of digital reading strategies. Based on this focus, the expected result of this study is the identification of a latent construct that explains how reading behavior, interaction patterns, and text characteristics operate simultaneously as an integrated digital reading strategy among medium-frequency social media users. This study is expected to produce an empirical model that clarifies whether these three dimensions form a single coherent factor or several separate strategy dimensions. The findings are also expected to provide a conceptual basis for developing instruments, designing digital literacy programs, and guiding further confirmatory studies that examine the relationship between digital reading strategies and reading comprehension outcomes.

METHOD

This study uses an exploratory quantitative approach with a survey design to identify the dimensions or latent structure of digital reading strategies in medium-frequency social media users. This approach was chosen because it is in accordance with the research objectives that focus on exploring the factor structure of a number of variables tested simultaneously. The research data source was 226 respondents, selected through a purposive sampling technique with the following criteria: active students at Makassar State University, active social media users, and medium-frequency social media users. The

determination of the sample is based on the results of previous research that moderate frequency social media users have a better reading comprehension (Basri et al., 2024). Medium frequency users access social media 1-3 hours per day (La Sala et al., 2025).

The instrument used in the form of a questionnaire included three variables, namely reading behavior, interaction patterns, and text characteristics which each consisted of 10 statement items. Reading behavior variables include indicators of self-regulation, processing strategies, digital navigation, and credibility evaluation. Indicators of interaction patterns include meaning production, curation, and text exploration. The text characteristic variables contain indicators of text structure, text complexity, modality, readability, and attractiveness. The questionnaire used a Likert scale with four answer choices, including (1) strongly disagree, (2) disagree, (3) agree, and (4) strongly agree. The questionnaire is created in *Microsoft Form format*. The instrument is equipped with an introduction explaining the purpose of the research, the guarantee of data confidentiality, the filling guide, and the respondent criteria. The researcher sent a link to the respondents with a filling duration of 10-13 minutes. Respondent data is anonymous.

Before the questionnaire is distributed to respondents, the instrument first goes through a content validity process by involving three experts as assessors (expert judgement), namely reading literacy experts, digital literacy experts, and educational evaluation experts. Experts were asked to assess the suitability, clarity, representation, and accuracy of the language of each statement item against the constructed being measured. Content validity is calculated using the Content Validity Index (CVI). The results of the assessment showed that all items met the criteria for the validity of the acceptable content with a scale-level CVI average (S-CVI/Ave) value at the reading behavior variable of 0.91, interaction pattern of 0.89, and text characteristics of 0.93, with an overall S-CVI/Ave value of 0.91. These results show that the questionnaire has strong content validity and is worth using. The results of the validity test using Pearson Product Moment Correlation show that all statements have a correlation coefficient value with a significance of $<.001$. Thus, it can be concluded that all instrument items are declared valid. Furthermore, the internal consistency of the instrument was measured using the Cronbach's Alpha test. The test results showed that all aspects and items had a value of r calculated $> r$ of the table (0.1300). Based on these results, all aspects and items of the research instrument were included in the reliability category. Table 1 summarizes the results of the validity and reliability test.

Variabel	Item	Sig. (2-tailed)	Corrected item-total correlation	Cronbach's alpha if item deleted	Cronbach's alpha
Reading Behavior	PeMe1	<.001	.339	.796	.798
	PeMe 2	<.001	.476	.780	
	PeMe 3	<.001	.427	.788	
	PeMe 4	<.001	.481	.780	
	PeMe 5	<.001	.358	.795	
	PeMe6	<.001	.360	.793	
	PeMe7	<.001	.599	.765	
	PeMe8	<.001	.636	.763	
	PeMe9	<.001	.487	.780	
	PeMe10	<.001	.593	.767	
Interaction Patterns	PoIn1	<.001	.484	.727	.757
	PoIn2	<.001	.491	.726	
	PoIn3	<.001	.252	.766	
	PoIn4	<.001	.493	.728	
	PoIn5	<.001	.485	.728	
	PoIn6	<.001	.480	.729	
	PoIn7	<.001	.456	.732	
	PoIn8	<.001	.498	.725	
	PoIn9	<.001	.317	.750	
	PoIn10	<.001	.281	.754	
Text Characteristics	KaTe1	<.001	.430	.818	.824
	KaTe2	<.001	.583	.801	
	KaTe3	<.001	.431	.817	
	KaTe4	<.001	.330	.830	
	KaTe5	<.001	.548	.806	
	KaTe6	<.001	.546	.805	
	KaTe7	<.001	.568	.802	
	KaTe8	<.001	.615	.798	
	KaTe9	<.001	.572	.803	
	KaTe10	<.001	.546	.805	

Table 1. Validity and Reliability Test Results

RESULTS AND DISCUSSION

Constructing an Integrative Digital Reading Strategy Model

The main findings of this study present the construction of an integrative digital reading strategy model built through exploratory factor analysis (EFA). This model integrates three main dimensions, namely reading behavior, interaction patterns, and text characteristics, as a single construct of digital reading strategy. The results of the EFA indicate that these three dimensions do not work separately, but are interconnected in shaping how readers organize the reading process, interact with digital texts, and respond to the characteristics of information presented in the digital space. These findings serve as the basis for interpreting the results of factor feasibility tests, communalities, eigenvalues, explained variance, and factor loadings as empirical evidence of the formation of a single latent construct of digital reading strategy. Data feasibility tests were carried out through the Kaiser-Meyer-Olkin (KMO) test and Bartlett's Test of Sphericity, presented in Table 2.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.664
Barlett's Test of Sphericity	Approx. Chi Square	230.906
	Df	3
	Sig.	<.001

Table 2. KMO and Bartlett's Test

Table 2 shows that the KMO value is 0.664 which means that the level of feasibility of the sample is included in the category of meeting for factor analysis. The results of *Bartlett's Test of Sphericity* showed an *approx. chi-square* value of 230.906 with a significance of $p < 0.001$, which means that there is a fairly strong correlation between variables. Thus, the data is eligible for factor analysis.

Furthermore, the results of the *anti-image matrices* showed that the value of *measures of sampling adequacy (MSA)* on each indicator was above 0.5, namely *reading behavior* (0.621), *interaction patterns* (0.811), and *text characteristics* (0.635). This reinforces that each indicator has an adequate correlation and can be used in factor analysis. The results of anti-image matrices are outlined in the following table.

		Reading Behavior	Interaction Patterns	Text Characteristics
Anti-image Covariance	Reading Behavior	.455	-.162	-.290
	Interaction Patterns	-.162	.718	-.102
	Text Characteristics	-.290	-.102	.480
Anti-image Correlation	Reading Behavior	.621a	-.284	-.622
	Interaction Patterns	-.284	.811a	-.174
	Text Characteristics	-.622	-.174	.635a

^a *Measures of Sampling Adequacy (MSA)*

Table 3. Anti-image Matrices

The contribution of the three variables to the factors formed is shown in the results of communalities in Table 4 below.

	Initial	Extraction
Reading Behavior	1.000	.792
Interaction Patterns	1.000	.578
Text Characteristics	1.000	.762

Table 4. Communalities

Table 4 shows that all three indicators have an extraction value above 0.5 which means that all variables have a sufficient contribution to the factors formed. The reading behavior extraction value was 0.792, interaction pattern was 0.578, and text characteristics were 0.762. This states that the three variables have a good clear power over the latent factors produced. Based on this data, the variables that have the highest contribution in sequence are reading behavior, text characteristics, and then interaction patterns. This finding is relevant to recent research reporting that reading strategies significantly reduce

reading comprehension in challenging environments (Wang & Hu, 2025). This finding confirms previous studies that digital reading is greatly influenced by the reader's skills in controlling the process of searching, navigating, and integrating information (Naumann et al., 2025).

The determination of the factors formed is determined by the total value of variance explained. The following Table 5 presents the results of the total variance explained.

Component	Total	Initial Eigenvalues		Extraction Sums of Squared Loadings		
		% of Variance	Sumulative %	Total	% of Variance	Sumulative %
1	2.132	71.070	71.070	2.132	71.070	71.070
2	.581	19.369	90.440			
3	.287	9.560	100.000			

Extraction Method: Principal Component Analysis (PCA)

Table 5. Total Variance Explained

Table 5 shows that there is one factor that has an *eigenvalue* of more than 1, namely component 1 with a value of 2.132, while components 2 and 3 have eigenvalues of 0.581 and 0.287, respectively. The results revealed that in the variables studied (reading behavior, interaction patterns, text characteristics) only 1 factor component formed. These results are also supported by a scree plot display that shows significant eigenvalues differences between components 1 with 2 and 3.

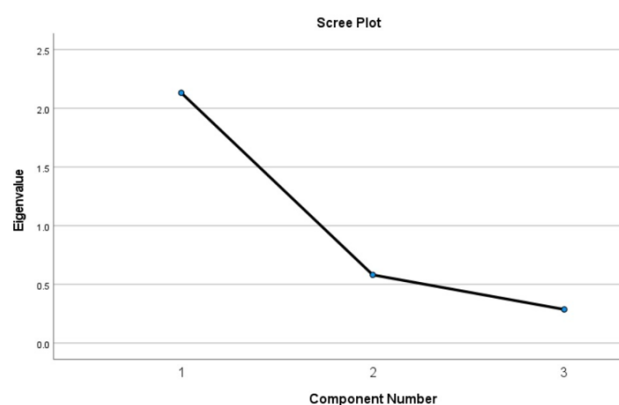


Figure 1. Scree Plot

The results of the analysis then show the value of the loading factor of each variable which aims to describe the relationship between the variable and the main factor formed from the extraction results. The value of the loading factor is presented in the following table.

	Component 1
Reading Behavior	.890
Interaction Patterns	.760
Text Characteristics	.873

Table 6. Component Matrix

The three variables showed high loading values, namely reading behavior (0.890), interaction patterns (0.760), and text characteristics (0.873). The results represent that all three variables work simultaneously when readers access content on social media. This single-component extraction has important theoretical implications in understanding the reading process as an integrated phenomenon (Kasperski & Ben-Yehudah, 2024; van Moort et al., 2025). These results show that reading behavior, patterns of interaction with text, and text characteristics do not stand alone but are interrelated to form a coherent one-dimensional or latent construct. These findings are in line with the *new literacies* framework that views online comprehension as an integrated social, cognitive, and textual practice (Coiro, 2020; Leu et al., 2011). These findings also confirm the understanding of the concept of reader-text interaction in the reading comprehension literature. Reader-text interaction aims to construct meaning (Calloway et al., 2023).

In general, the results of the analysis of exploratory factors show that the variables of reading behavior, interaction patterns, and characteristics of the text are grouped in one factor with a contribution of variance of 71.07% (see Table 4). This value represents one component of a good model and exceeds the standard of 70% (Kaiser, 1974). This confirms that the three variables are correlated with each other and together form a single construct that describes the pattern of students' reading strategies in the context of digital literacy. Thus, the single factor formed describes the integrative digital reading strategy model. The model is visualized as follows.

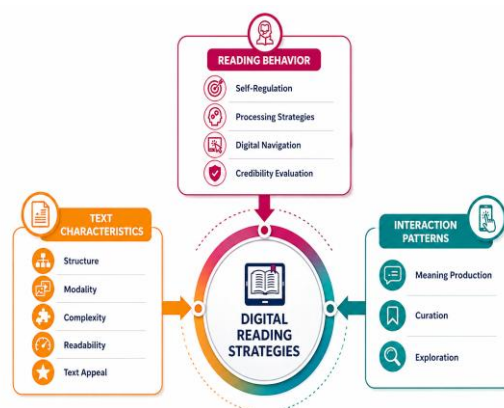


Figure 2. Integrative Digital Reading Strategy Model

Dimensions of Reading Behavior in the Construct of Integrative Digital Reading Strategies

The reading behavior loading value (0.890) shows that this dimension is the strongest indicator representing the construct of integrative digital reading strategies in

the study sample. Reading behavior indicators include self-regulation, processing strategies, digital navigation, and credibility evaluation are components of the digital reading strategy construct. Indicators of self-regulation include goal setting, attention control, and adjustment of strategies that guide the reading process to be in harmony with the intent or demand. Self-regulation is an essential metacognitive process that makes individuals more engaged in reading activities, monitoring reading improvement, and evaluating reading outcomes (Teng & Zhang, 2022; Woolley, 2011). A proactive self-regulation process can help develop critical thinking skills as part of supporting comprehension skills. Therefore, self-regulation is an important indicator in shaping student reading behavior on social media. These findings confirm previous studies that have shown that self-regulation plays an important role in influencing reading comprehension (Maimaiti & Hew, 2025; Mohammadi et al., 2023). In addition, other findings confirm that social media use and digital reading literacy are positively mediated by self-regulation (Chen et al., 2021).

Processing strategies represent aspects of regulating the depth of information processing in digital reading practice. The processing strategy plays a role in regulating the depth and quality of information processing according to demands and needs. Readers who carry out processing strategies are aware of the purpose and have the potential to make a change in strategy from a surface one to a more coherent one (Afflerbach et al., 2011). Empirical evidence suggests that the use of richer processing strategies including *skimming*, rereading, note-taking, annotation, and the organization of reading flows contributes to online comprehension performance (Habók et al., 2024). In hyperlinked digital contexts, readers are adept at orchestrating *directional skimming*, evaluating key points, and selectively rereading throughout the cycle of finding, assessing, and synthesizing information (Leu et al., 2014). Thus, the processing strategy becomes a cognitive control mechanism that ensures that relevant information is sorted and integrated so as to support a more coherent integration of information in the digital reading process.

Digital navigation represents the ability to direct search and search across sources. The literature shows this ability is associated with online comprehension performance, while this study places it as part of the construct of digital reading strategies. Readers who are adept at organizing search objectives, choosing the right keywords, following relevant link paths, and maintaining cross-page coherence tend to build a more complete representation of meaning than readers who move randomly. Skilled readers orchestrate

the steps of finding, assessing, and synthesizing with directional navigation (Coiro & Dobler, 2007). These findings confirm previous studies that revealed that navigation patterns (browsing hyperlinks, returning to the main page, and mapping information) were positively associated with comprehension performance (Norberg et al., 2025). Digital navigation becomes a strategic process that enables multi-source evaluation and synthesis. This is in line with the findings of the literature on the use of multiple literature that the ability to trace and construct cross-document reading paths is a prerequisite for connecting claims, evidence, and sources (List & Alexander, 2019). In lateral reading, moving out of one page to check credibility in another source suggests that strategic navigation is a core mechanism that aligns access to information with assessment and integration that results in more accurate understanding (McGrew, 2024).

Credibility evaluation is the habit of examining sources, comparing cross-linking claims, examining the author's authorial authority, and assessing supporting evidence as part of the reading behavior indicators that contribute to forming latent factors in the findings of this study. Readers who conduct credibility evaluations systematically filter out weak information and integrate only valid evidence resulting in a more accurate understanding. These findings are in line with research (Deng et al., 2019; Metzger & Flanagin, 2013) showing that credibility evaluations influence information integration decisions when reading. Thus, credibility evaluation acts as an epistemic filter that links access to information with the construction of meaning. Theoretically, credibility evaluation can interact with other strategies (e.g. processing strategies) in digital reading practice, but inter-indicator interactions are not causally tested in this EFA design. Credibility evaluations that are carried out consciously and are proven to make the integration of multi-source information more coherent and valid (Tarchi et al., 2025).

Dimensions of Text Characteristics in the Construct of Integrative Digital Reading Strategies

The text characteristic is the second variable that has a high loading value (*loading*: 0.873). Indicators of text characteristics include text structure, text complexity, modality, readability, and text appeal. The text structure items under review contain a hierarchical organization with subheadings, summaries, and sequential formatting (*carousel/thread*). Text characteristics represent the textual aspects that contain the constructs of digital reading strategies and facilitate the integration of key ideas with supporting details. Text presented in a structured manner makes it easier for readers to understand the content of

the text (Roehling et al., 2017). Structural markers clarify the relationship between ideas and reduce the reader's disorientation, thus increasing the chances of the formation of a representation of meaning. Thus, the structure of the text acts as a cognitive map that directs the process of extraction, organization, and integration of information in a digital ecosystem that tends to be multimodal (Dessavre & Ramirez-Marquez, 2019).

The findings of this study reveal that the complexity of texts manifested in technical terms without explanation and the length of the text are indicators of text characteristics that contribute to the construction of digital reading strategies. The use of simple diction and relatively short text helps comprehension performance (Sua, 2021). In social media posts, complexity manifests as microtext fragments that lack cross-post cohesion, hyperlinks that demand navigation between documents, and mixed modalities (text-image-video) that have the potential to trigger divided attention. Text on social media is presented in a combination format of text, images, infographics, videos, and interactive links that influence the way readers allocate attention, integrate verbal-visual representations, and emphasize cognitive load. Content on social media tends to be presented by applying the principle of combination. This makes it easy for readers to understand the information presented. The text-image integration model also explains that function-aligned visuals (not just decorative) lower disorientation and support inference, while modality misalignment triggers divided attention that decreases comprehension (Mutlu-Bayraktar et al., 2022). Modalities act as cognitive navigation guides that help readers extract and unify key ideas among scattered information. Thus, the quality of modality design determines the reader's ability to find, assess, and integrate information.

Readability and attractiveness are positioned as indicators of text characteristics that have the potential to relate to the ease of processing and readers' attention in digital reading. Text readability on social media includes the use of simple words and tends to be informal, so that the cognitive burden and information processing are lighter. Readability that aligns with the reader's profile becomes a defining element in the process of extracting, organizing, and integrating information into accurate comprehension (Strohmaier et al., 2023). In addition, the appeal of the text becomes supportive through increased attention. The interest caused by attractive designs can increase the desire to process information (Alpizar et al., 2020). Therefore, the attractiveness of the text is a supporting part so that readers are interested in processing information.

Dimensions of Interaction Patterns in the Construct of Integrative Digital Reading Strategies

The third variable in this study is the interaction pattern with a *loading value* of 0.760. Indicators of interaction patterns include meaning production, curation, and text exploration. The findings show that the production of meaning is an indicator of interaction patterns that represent reader participatory engagement with medium-frequency social media users. The production of meaning through writing summaries in the comment column, discussing, and turning the text into a summary makes the reader carry out conceptual elaboration and externalization of understanding. These findings are relevant to participatory literacy research which states that the practice of commenting and discussion encourages knowledge reconstruction and the formulation of ideas (Zhu et al., 2023). Readers who communicate text by rewriting show better performance (Lawson & Mayer, 2024). Furthermore, in the social media ecosystem, cognitive engagement is the main channel that links interaction with increased understanding (Lyu & Hu, 2025).

Other findings reveal that text curation and exploration are indicators of interaction patterns that represent the practice of content selection and verification in digital reading. Curation has readers select content based on relevance and credibility, compile a coherent reading list, and then connect pieces of cross-source information before concluding. The curation practice strengthens the PISA digital reading literacy framework (OECD, 2021). This practice is also relevant to the use of multi-text stating that the ability to select and organize related documents is a prerequisite for resolving conflicts between texts and generating deeper understanding (List & Alexander, 2019). Furthermore, text exploration plays a role in verifying claims so that reading comprehension is more accurate. This practice is relevant to *lateral reading* which emphasizes validating the reading before constructing meaning (Guath & Nygren, 2022).

CONCLUSION

This study shows that reading behavior, interaction patterns, and text characteristics in medium-frequency social media users can be represented in one latent factor, which is termed as an integrative digital reading strategy model. EFA's findings show that the data is feasible to factor (adequate KMO and significant Bartlett) and produce one factor with an eigenvalue of 2.132 which explains 71.07% variance, accompanied by high loading in all three dimensions. These results indicate that digital reading strategies in the context of social media are an integrated construct (cognitive–social–textual), not a stand-alone

dimension. Theoretically, this study expands the understanding of digital literacy by presenting a conceptual model of reading strategies that integrates the dimensions of reading behavior, interaction patterns, and text characteristics in the context of social media. Practically, the results of this study can be used as a basis for designing digital literacy improvement programs that focus on reading development strategies. In addition, these findings can be used by educators and policymakers in designing literacy interventions that are adaptive to the behavior of social media users to improve the ability to understand, select, and share more deeply. Further research is recommended to conduct confirmatory factor analysis (CFA) on different samples and test the relationship of these constructs with relevant outcome indicators.

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DECLARATIONS

Ethical considerations

Not applicable

Use of artificial intelligence (AI)

The authors declare that the generative artificial intelligence (AI) tool ChatGPT was used exclusively for language editing and grammatical improvement. The use of AI did not influence the scientific content, study design, data analysis, data interpretation, results, or conclusions of the manuscript. Full responsibility for the content remains with the authors.

Conflict of Interest

The authors declare no conflicts of interest.

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