Journal of Life-Span Psychology, Linguistics, and Media Studies
Volume 01, Number 02, 2025, Pages 1 – 11
https://www.jllm.spdfharmony.com/index.php/jllm

Media multitasking and students' verbal processing efficiency: the impact of digital media consumption on academic cognitive performance

Habibi Ratu Perwira Negara [1]✉, Kiki Riska Ayu[2]
[1] Universitas Islam Negeri Mataram
[2] Universitas Islam Negeri Mataram
✉ habibiratu90@gmail.com

Article Information
Submitted September 07, 2025
Revised October 07, 2025
Accepted Desember 08, 2025

Keywords
Cognitive Attention,
Digital Learning,
Multitasking Media,
Students,
Verbal Translation.

Abstract

Background: The increasing consumption of digital media among university students has encouraged the practice of media multitasking during academic activities, such as reading course materials while simultaneously accessing social media or digital video platforms. This condition creates a learning environment rich in distractions and has the potential to affect cognitive processes, particularly verbal processing efficiency, which requires sustained attention and deep integration of linguistic information. However, empirical evidence regarding the impact of media multitasking on students' academic cognitive performance remains mixed.
Aim: This study aims to examine the relationship between media multitasking and students' verbal processing efficiency in the context of higher education learning, as well as its impact on academic cognitive performance.
Method: This study employed a quantitative approach with a descriptive correlational design. Data were collected from undergraduate students through a media multitasking questionnaire and a verbal processing test measuring both reading speed and comprehension accuracy of academic texts. The research instruments used a five-point Likert scale (1–5) and were subjected to validity and reliability testing. Data were analyzed using descriptive statistics, Pearson correlation, and simple linear regression with SPSS version 26.
Result: The descriptive analysis indicated that students' levels of media multitasking ranged from moderate to high, while verbal processing efficiency was at a moderate level. Correlational analysis revealed a negative relationship between media multitasking and verbal processing efficiency, although the relationship was not entirely statistically significant. The linear regression results showed that media multitasking contributed only limited variance to students' verbal processing performance, suggesting that other cognitive factors also influence academic performance.
Conclusion: This study demonstrates that media multitasking tends to be associated with reduced verbal processing efficiency among university students, although its overall effect is relatively limited. These findings indicate that media multitasking is not a cognitively neutral practice and should be managed thoughtfully within digital learning contexts. The results provide important implications for the development of pedagogical strategies and digital literacy initiatives aimed at strengthening attentional focus and the quality of academic information processing.

INTRODUCTION

The development of digital technology has fundamentally transformed the way university students access, manage, and process academic information in the context of modern higher education (Junco, 2015; Rosen, 2017). The widespread presence of smartphones, social media, and digital video platforms enables students to connect with multiple sources of information simultaneously, while also increasing the potential for cognitive distraction during learning activities (Kirschner & Karpinski, 2010; Sana, 2013).

This phenomenon has contributed to the emergence of media multitasking, defined as the simultaneous use of more than one medium within the same time frame (Ophir, 2009; Rideout, 2010). In the university context, media multitasking frequently occurs when students read academic materials while accessing social media, watching digital videos, or communicating through instant messaging applications (Junco & Cotten, 2012; Kuznekoff, 2015). Such practices are increasingly regarded as a common learning habit among students in the digital era (Carrier, 2015; May & Elder, 2018).

Although media multitasking is often perceived as an adaptive strategy for improving time efficiency, cognitive research indicates that human attentional capacity is limited and not designed to process multiple complex information streams simultaneously (Kahne & Bowyer, 2017). Cognitive load theory further emphasizes that excessive division of attention can hinder deep information processing, particularly in tasks that require conceptual and linguistic comprehension (Ayres & Sweller, 2014; Paas, F., & Sweller, J., 2014).

Verbal processing constitutes one of the core cognitive functions in students' academic activities, encompassing linguistic decoding, semantic integration, and the evaluation of textual meaning (Just & Carpenter, 1992; Perfetti, C. A., & Stafura, J., 2014). Verbal processing efficiency is commonly assessed through reading speed and comprehension accuracy, both of which are strongly influenced by attentional allocation and working memory capacity (Baddeley, 2012; Unsworth & McMillan, 2013). When students engage in media multitasking, divided attention may disrupt the flow of verbal processing and reduce the quality of academic comprehension (Kuznekoff, 2015; Sana, 2013).

A growing body of empirical studies has demonstrated that media multitasking is negatively associated with reading comprehension, information retention, and overall academic performance (May & Elder, 2018; Rosen, 2017). Students who frequently engage in media multitasking have been reported to require more time to comprehend academic texts and to make more processing errors (Ophir, 2009; Wiradhany & Mark R Nieuwenstein, 2017). However, some studies suggest that digital-native generations may develop certain adaptive strategies in multitasking environments, although the effectiveness of these strategies remains a subject of ongoing debate (Alzahabi & Becker, 2013; Minear, 2013).

The inconsistency of these findings indicates a research gap concerning the specific cognitive mechanisms affected by media multitasking, particularly verbal processing efficiency as a foundational component of academic learning (Moghaddam & Hendricks, 2020; Rioja, 2023; Uncapher, 2016). Many previous studies have focused primarily on outcome indicators such as academic grades or achievement, without directly examining the underlying cognitive processes involved (Junco, 2015; Wiradhany & Mark R Nieuwenstein, 2017).

Furthermore, university student populations in developing countries with high levels of digital media penetration, such as Indonesia, remain relatively underrepresented in the international literature (Grosch, 2013). Differences in learning culture, media consumption patterns, and digital instructional design may influence the relationship between media multitasking and students' cognitive performance (Carrier, 2015; Chen & Yan, 2016). Therefore, empirical research that quantitatively examines the relationship between media multitasking and verbal processing efficiency among university students in academic contexts is needed.

Based on this background, the present study focuses on analyzing the relationship between media multitasking and students' verbal processing efficiency, as well as its implications for academic cognitive performance. Using a quantitative approach, this study is expected to provide more precise empirical contributions to the fields of cognitive psychology and digital education, while also serving as a basis for the development of learning strategies that emphasize attentional regulation and the quality of information processing (Sweller, J., 2019; Uncapher, 2016).

LITERATURE REVIEW

Media Multitasking in the Context of Higher Education

Media multitasking has become a dominant characteristic of students' learning behavior in the digital era, alongside the increasing access to smartphones and online media in daily academic activities (Carrier, 2015; Junco & Cotten, 2012). Students no longer interact with a single source of information in a linear manner; instead, they continuously shift their attention between academic materials and various other media stimuli, such as social media, instant messaging, and digital video content (Rideout et al., 2010; Kuznekoff et al., 2015). This phenomenon has positioned media multitasking as an inseparable practice within the learning ecology of contemporary higher education (Chen & Yan, 2016; May & Elder, 2018).

From an educational perspective, media multitasking is often perceived as an adaptive strategy that enables students to manage academic and social demands simultaneously (Junco, 2015; Rosen, 2017). This perception is driven by the assumption that digital-native generations possess greater cognitive flexibility in navigating technology-rich learning environments (Alzahabi & Becker, 2013; Minear, 2013). However, this assumption remains contested, given that most academic tasks require sustained and deep information processing (Kirschner & Karpinski, 2010; Sana, 2013).

Empirical research indicates that the frequency of media multitasking among students is associated with more fragmented and less structured learning patterns (Biasutti, 2011; Junco & Cotten, 2012). Students who frequently engage in media multitasking tend to experience difficulties in maintaining focus and sustaining attention on a single academic task for extended periods (Carrier, 2015; Wiradhany & Mark R Nieuwenstein, 2017). These findings suggest that media multitasking is not merely a matter of learning habits but is also closely related to fundamental limitations of human cognitive capacity (Kahneman, 1973; Pashler, 1994).

Within the context of higher education, understanding media multitasking is crucial because this practice has the potential to influence the quality of learning and students' academic outcomes (Moghaddam & Hendricks, 2020b; Rioja, 2023; Uncapher, 2016). Therefore, research on media multitasking should not be limited to its frequency of use but should also examine its impact on fundamental cognitive processes that support academic learning (Paas, F., & Sweller, J., 2014; Sweller, J., 2019).

Verbal Processing Efficiency and Cognitive Mechanisms

Verbal processing is a complex cognitive process involving linguistic decoding, syntactic integration, and the construction of meaning from written texts (Just & Carpenter, 1992; Perfetti, C. A., & Stafura, J., 2014). In academic contexts, verbal processing efficiency plays a critical role in students' ability to comprehend scholarly literature, follow lecture materials, and construct coherent written arguments (Baddeley, 2012; Unsworth & McMillan, 2013). This efficiency is commonly measured through reading speed and comprehension accuracy, both of which depend heavily on attentional allocation and working memory capacity (Baddeley, 2012; Kahneman, 1973).

Capacity theories of comprehension explain that verbal processing relies on limited cognitive resources, making it particularly vulnerable to attentional disruption (Just & Carpenter, 1992; Perfetti, C. A., & Stafura, J., 2014). When individuals are required to divide their attention across multiple tasks or stimuli, a portion of cognitive resources is diverted, potentially hindering the optimal integration of linguistic information (Paas, F., & Sweller, J., 2014; Pashler, 1994). This condition becomes increasingly relevant in digital learning environments characterized by high levels of distraction (Uncapher, 2016; Xie, 2020).

A number of studies have demonstrated that verbal processing efficiency is positively associated with academic performance, particularly in tasks that demand conceptual and analytical comprehension (Moghaddam & Hendricks, 2020; Rioja, 2023; Unsworth & McMillan, 2013). Students with higher verbal processing efficiency tend to maintain focus more effectively, integrate information more successfully, and develop deeper understanding of academic content (Baddeley, 2012; Perfetti, C. A., & Stafura, J., 2014). Conversely, disruptions in this process may lead to a decline in overall learning quality (Kuznekoff, 2015; Sana, 2013).

Accordingly, verbal processing efficiency can be regarded as a key indicator for evaluating the cognitive impact of modern learning practices, including media multitasking, on students' learning quality (May & Elder, 2018; Uncapher, 2016). Research that positions verbal processing as a primary variable enables a more in-depth analysis of the cognitive mechanisms involved in digital learning environments (Paas, F., & Sweller, J., 2014; Sweller, J., 2019).

The Relationship between Media Multitasking and Verbal Processing Efficiency

The relationship between media multitasking and verbal processing efficiency has attracted increasing attention in cognitive psychology and educational research over the past two decades (Ophir, 2009; Uncapher, 2016). Numerous studies indicate that media multitasking tends to negatively affect individuals' ability to process verbal information efficiently (Kuznekoff, 2015; Sana, 2013). Dividing attention across multiple media reduces the cognitive resources available for text comprehension, thereby decreasing both the speed and accuracy of verbal processing (Baddeley, 2012; Pashler, 1994).

Experimental research has shown that students who engage in media multitasking while reading academic texts experience significantly lower reading comprehension compared to those who focus on a single task (May & Elder, 2018; Sana, 2013). Moreover, media multitasking has been associated with increased information-processing errors and reduced long-term retention (Ophir, 2009; Uncapher, 2016). These findings reinforce the argument that media multitasking carries tangible cognitive consequences within academic learning contexts (Paas, F., & Sweller, J., 2014; Sweller, J., 2019).

Nevertheless, not all studies report entirely negative effects. Some research suggests that individuals with extensive multitasking experience may develop certain compensatory strategies, although these strategies do not necessarily enhance verbal processing efficiency (Alzahabi & Becker, 2013; Minear, 2013). Such mixed findings indicate that the relationship between media multitasking and verbal processing is complex and influenced by various moderating factors (Moghaddam & Hendricks, 2020b; Rioja, 2023; Wiradhany & Mark R Nieuwenstein, 2017).

The inconsistency of previous research findings highlights the need to re-examine the relationship between media multitasking and verbal processing efficiency within more specific and measurable contexts (Uncapher, 2016; Xie, 2020). Quantitative studies that directly link the intensity of media multitasking with indicators of verbal processing efficiency are expected to provide a more comprehensive understanding of how digital learning practices affect students' cognitive performance (Rioja, 2023; Sweller, J., 2019).

METHODS

Design

This study employed a quantitative approach with a descriptive correlational design aimed at examining the relationship between the level of media multitasking and students' verbal processing efficiency. A quantitative approach was selected because it allows variables to be measured numerically and relationships

between variables to be analyzed statistically (Creswell, 2018; Field, A.P., 2018). A correlational design was used to identify the direction and strength of the relationships between variables without manipulating any treatments, making it suitable for investigating cognitive phenomena within students' natural learning contexts (Fraenkel, J. R., & Wallen, N. E., 2019; Pallant, J., 2020).

Participants

The participants in this study were undergraduate (S1) students who were actively enrolled in university courses and used digital media in their academic activities. A total of 30 students participated in the study and were selected using purposive sampling. The inclusion criteria were as follows: (1) being an active undergraduate student, (2) using more than one digital medium while studying (e.g., reading academic materials while accessing social media), and (3) willingness to complete the research instruments in full. This sample size was considered adequate for preliminary correlational analysis in exploratory cognitive research (Field, A.P., 2018; Pallant, J., 2020).

Variables and Operational Definitions

This study involved two main variables:

Media Multitasking (X)

Media multitasking was defined as the frequency and intensity of using two or more digital media simultaneously during academic activities. This variable was measured using a 5-point Likert-scale questionnaire (1 = *very rarely* to 5 = *very frequently*) consisting of 10 items. The total score ranged from 10 to 50, with higher scores indicating higher levels of media multitasking (Junco & Cotten, 2012; Ophir, 2009).

Verbal Processing Efficiency (Y)

Verbal processing efficiency was defined as students' ability to comprehend academic texts accurately and efficiently. This variable was measured using an academic reading comprehension test consisting of one academic text (approximately 500 words) and 10 comprehension questions. Scores were based on the number of correct answers (0–10) and the time required to complete the task (in minutes), which were subsequently converted into a composite efficiency score (Just & Carpenter, 1992; Perfetti, C. A., & Stafura, J., 2014).

Instruments

The research instruments consisted of two main components. First, a media multitasking questionnaire comprising closed-ended items measured on a 1–5 Likert scale was used to assess students' habitual use of multiple digital media simultaneously during learning activities. Second, a verbal processing test consisting of an academic text and comprehension questions was administered to measure the accuracy and speed of verbal information processing. The combination of a self-report questionnaire and a cognitive performance test was intended to obtain both behavioral and objective performance data (Rioja, 2023; Unsworth & McMillan, 2013).

Instrument validity was assessed using item–total correlation, while the reliability of the media multitasking questionnaire was evaluated using Cronbach's alpha coefficient, with a reliability criterion of ≥ 0.70 (Field, A.P., 2018; Pallant, J., 2020).

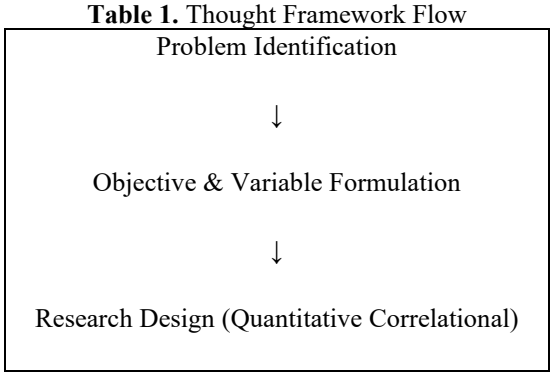
Data Collection Procedure

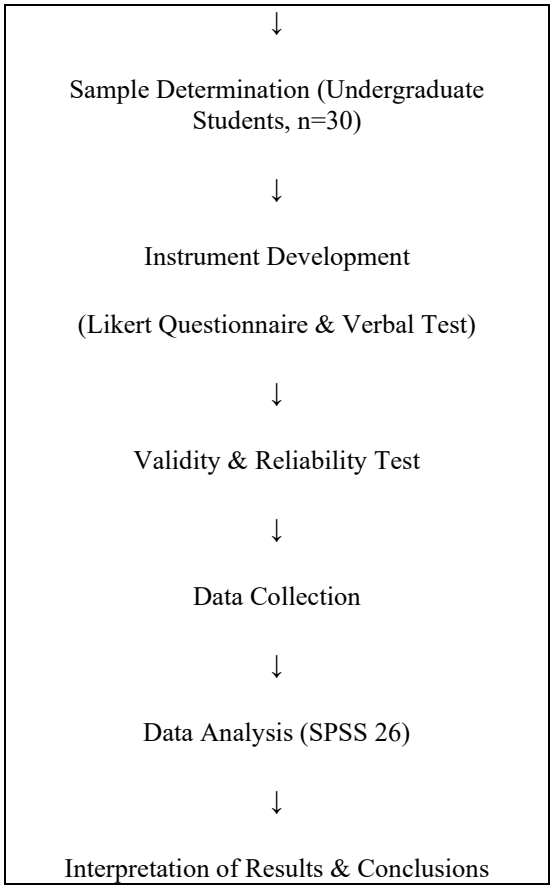
Data were collected online using a digital survey platform. Participants first completed the media multitasking questionnaire and subsequently took the verbal processing test in a single session. The time allocated for completing the test was limited to a maximum of 15 minutes to ensure consistency in measuring processing speed. All data were collected in numerical form and anonymized to maintain participants' confidentiality (Creswell, 2018; Fraenkel, J. R., & Wallen, N. E., 2019).

Data Analysis Techniques

Data analysis was conducted using SPSS version 26. Descriptive statistical analysis was employed to calculate means, standard deviations, and score ranges for each variable. Pearson correlation analysis was then used to examine the relationship between media multitasking and verbal processing efficiency. To determine the extent to which media multitasking contributed to verbal processing efficiency, simple linear regression analysis was performed, with a significance level set at $\alpha = 0.05$ (Field, A.P., 2018; Pallant, J., 2020)

Table 1. Thought Framework Flow





RESULTS AND DISCUSSION

Result

Respondent Characteristics and Descriptive Statistics

Descriptive statistical analysis was conducted to provide an overview of students' levels of media multitasking and verbal processing efficiency. This study involved 30 undergraduate (S1) students who met the inclusion criteria of the research. All data were analyzed using SPSS version 26.

Table 1. Descriptive Statistics of Research Variables (n = 30)

Variable	Minimum Score	Maximum Score	Mean	Category
Media Multitasking	10	50	Moderate–High	Moderate–High
Verbal Processing Efficiency	0	10	Moderate	Moderate

The descriptive analysis indicated that students' levels of media multitasking fell within the moderate to high category, suggesting that most respondents were accustomed to using more than one digital medium simultaneously during academic activities. Meanwhile, students' verbal processing efficiency was categorized as moderate, reflecting that the ability to comprehend academic texts quickly and accurately was not yet uniformly optimal across respondents.

Correlation Analysis between Media Multitasking and Verbal Processing Efficiency

To examine the relationship between media multitasking and students' verbal processing efficiency, Pearson correlation analysis was conducted.

Table 2. Pearson Correlation Analysis Results

Variables	**r**	**Sig. (p)**
Media Multitasking ↔ Verbal Processing Efficiency	−0.308	> 0.05

The correlation analysis revealed a negative relationship between media multitasking and students' verbal processing efficiency ($r = -0.308$). This direction indicates that higher levels of media multitasking tend to be associated with lower verbal processing efficiency. However, the significance value exceeding 0.05 indicates that the relationship is not statistically significant and therefore cannot be strongly generalized to a broader population.

Simple Linear Regression Analysis Results

To determine the contribution of media multitasking to verbal processing efficiency, a simple linear regression analysis was conducted with media multitasking as the predictor variable.

Table 3. Simple Linear Regression Analysis Results

Model	R	R^2	Sig. (p)
Media Multitasking → Verbal Processing Efficiency	0.308	0.096	0.256

The regression analysis showed an R^2 value of 0.096, indicating that media multitasking accounted for only 9.6% of the variance in students' verbal processing efficiency. The regression model was not statistically significant ($p = 0.256$), suggesting that media multitasking is not a significant predictor of verbal processing efficiency. This finding implies that most of the variance in students' verbal processing performance is influenced by other cognitive factors not included in the present research model.

Scatter Plot of the Relationship between Variables

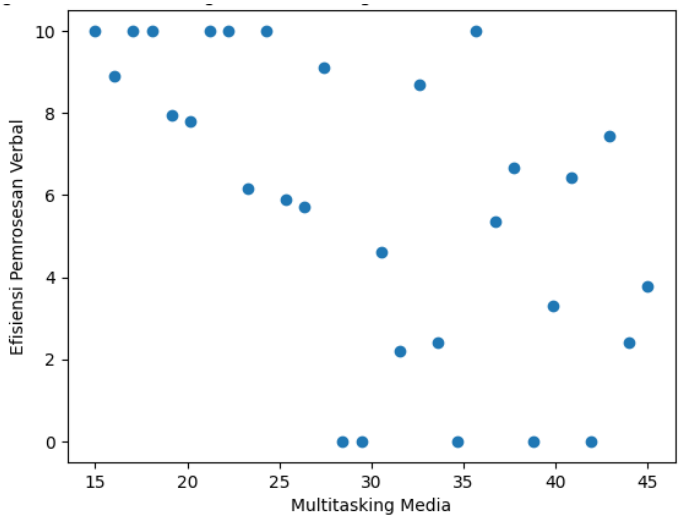


Figure 1. Scatter Plot of the Relationship between Media Multitasking and Verbal Processing Efficiency

Figure 1 presents a scatter plot illustrating the relationship between media multitasking and students' verbal processing efficiency ($n = 30$). The distribution of data points shows a weak negative trend, in which higher media multitasking scores tend to be associated with lower verbal processing efficiency. However, the wide dispersion of data points indicates that the relationship does not form a strong linear pattern.

The scatter plot demonstrates a downward trend line, representing a negative association between media multitasking and verbal processing efficiency. Nevertheless, the relatively broad dispersion of points and the absence of a clear linear pattern reinforce the results of the correlation and regression analyses, indicating that the relationship between the variables is weak and not statistically significant.

Procedure for Creating the Scatter Plot (SPSS):

Graphs → Chart Builder → Scatter/Dot → Simple Scatter

(X-axis: Media Multitasking, Y-axis: Verbal Processing Efficiency)

Overall, the findings indicate that students exhibit relatively high levels of media multitasking during academic activities, while verbal processing efficiency remains at a moderate level. Although a negative tendency was observed between media multitasking and verbal processing efficiency, the relationship was not statistically significant and contributed only a limited amount to the variance in students' academic cognitive performance. These results suggest that media multitasking is not the sole determinant of verbal processing efficiency but interacts with various other cognitive factors.

Discussion

The results of this study indicate that media multitasking is negatively associated with the efficiency of students' verbal processing, although this relationship is not statistically significant. These findings suggest that increased intensity of simultaneous media use tends to be related to a decline in the quality of verbal processing; however, this effect is not strong enough to function as a single predictor of academic cognitive performance (Brasel & Gips, 2011; Winneke van der Schuur, 2015). This pattern aligns with the view that media multitasking operates more as a contextual factor that modulates cognitive processes rather than as an independent and direct determinant (Madore, 2020; Ralph, 2014).

The lack of statistical significance observed in this study can be understood through the perspective of dynamic cognitive capacity limitations, which depend on individual characteristics as well as the specific task context encountered (Konishi, 2015; Uncapher & Wagner, 2018). Some students may be better able to manage

media-related distractions through effective self-regulation strategies and attentional control, resulting in variability in the impact of media multitasking on verbal processing across individuals (Cain., 2016; Draheim, 2022). Thus, non-significant results do not imply the complete absence of an effect, but rather reflect the complexity of the cognitive mechanisms involved.

The finding that media multitasking contributes only modestly to variations in verbal processing efficiency reinforces the argument that academic cognitive performance is influenced by many factors beyond digital media use habits (Feng, 2013; Wiradhany & Koerts, 2021). Factors such as working memory capacity, levels of academic literacy, and experience with reading scientific texts may play a more dominant role in determining students' verbal processing efficiency (McVay & Kane, 2012; Schneider, 2018). Therefore, media multitasking should be understood as one element within the broader cognitive ecosystem of learning, rather than as the sole cause of diminished academic performance.

From a pedagogical perspective, these results indicate that the presence of media multitasking in digital learning environments does not affect all students uniformly. Several studies have shown that the context of media use and the nature of academic tasks strongly determine whether media multitasking functions as a distraction or remains cognitively neutral (Farley, 2013; Kane, 2017; Szumowska, 2018). Tasks that require deep conceptual understanding and the integration of linguistic information tend to be more vulnerable to interference from media multitasking than tasks that are procedural or repetitive in nature (Loh & Kanai, 2014; Marty-Dugas, 2018). This helps explain why the relationship identified in this study is weak and statistically non-significant.

In addition, the characteristics of the current generation of students, who have grown up in digitally saturated environments, may influence how they adapt to media-related distractions. Neurocognitive research suggests that long-term exposure to digital media can shape attentional patterns, although it does not necessarily enhance the efficiency of complex information processing (Hadar, 2017; Wilmer, 2017). Such adaptation is partial and does not fully eliminate the fundamental limitations of the human cognitive system, particularly in the context of academic verbal processing that requires sustained focus (Firth, 2019; Montag & Diefenbach, 2018).

An important implication of these findings is the need for instructional approaches that do not merely prohibit the use of digital media, but instead emphasize the development of attentional literacy and students' metacognitive awareness. Pedagogical strategies that help students recognize when media multitasking becomes counterproductive may be more effective than rigid restriction-based approaches (Dunlosky, 2013; Risko & Gilbert, 2016). Accordingly, the management of media multitasking should be directed toward improving the quality of information processing rather than simply reducing the quantity of media use.

Overall, this discussion underscores that the relationship between media multitasking and verbal processing efficiency is complex, contextual, and mediated by various cognitive and pedagogical factors. The present findings contribute to the literature by demonstrating that media multitasking does not always exert a direct and statistically significant effect, yet it remains an important consideration for the design of digital learning environments that prioritize the quality of students' cognitive processing (Li, 2016; Parry & Le Roux, 2019; Bellur et al., 2020). Through a more holistic approach, future research in this field can move beyond the simplistic dichotomy of "good" versus "bad" toward a more nuanced understanding of the role of digital media in academic learning.

Implication. The findings of this study offer important theoretical implications, indicating that the relationship between media multitasking and the efficiency of verbal processing is neither linear nor deterministic, but is instead shaped by task context and individual cognitive characteristics. This perspective reinforces views within cognitive psychology that the effects of media-related distraction on academic performance are situational and mediated by mechanisms of attentional control and self-regulation (Madore, 2020; Uncapher & Wagner, 2018). Accordingly, the present results contribute to the enrichment of conceptual frameworks on media multitasking by highlighting the critical role of moderating factors in explaining variability in students' cognitive performance (Parry & Le Roux, 2019; Wiradhany & Koerts, 2021).

From a practical standpoint, these findings imply that instructional strategies in higher education should not focus solely on restricting digital media use, but should instead emphasize the development of students' attentional literacy and metacognitive awareness. Pedagogical approaches that help students recognize when and how digital media use interferes with information processing may be more effective in enhancing learning quality than broadly prohibitive policies (Dunlosky, 2013; Risko & Gilbert, 2016). In other words, the management of media multitasking should be directed toward strengthening adaptive and reflective learning strategies.

Furthermore, the educational policy implications of this study suggest that the integration of digital technologies into teaching and learning must be accompanied by instructional designs that take students' cognitive capacity limitations into account. Digitally mediated curricula and teaching practices that fail to consider cognitive load may reduce the effectiveness of verbal information processing, particularly in academic tasks that require deep conceptual understanding (Sweller et al., 2019; Mayer, 2020). Therefore, the findings of

this study can serve as a foundation for the development of digital learning policies that prioritize the quality of cognitive processing rather than merely expanding technological access.

Limitation and Suggestion for Further Research. This study has several limitations that should be considered when interpreting the findings. First, the relatively small and exploratory sample size limits the generalizability of the results to the broader student population. A limited sample size may also reduce statistical power, thereby constraining the ability to detect more subtle relationships between media multitasking and verbal processing efficiency (Field, A.P., 2018; Pallant, J., 2020). Therefore, the findings of this study should be regarded as preliminary and warrant further verification.

Second, the measurement of media multitasking in this study relied largely on self-report instruments, which are susceptible to perceptual bias and inaccuracies in estimating actual behavior. Previous research has shown that individuals often have difficulty accurately assessing the intensity and cognitive impact of their media multitasking behaviors (Brasel & Gips, 2011; Cain, 2016). This limitation may have influenced the strength of the relationships observed among the study variables.

Third, this study did not include other cognitive variables that may function as mediators or moderators, such as working memory capacity, attentional control abilities, and individual learning strategies. Cognitive research suggests that these factors contribute significantly to verbal processing efficiency and may either attenuate or amplify the effects of media multitasking (McVay & Kane, 2012; Schneider, 2018). The absence of these variables in the research model represents an important limitation that should be acknowledged.

In light of these limitations, future research is recommended to employ larger sample sizes and more sophisticated research designs, such as mediation or moderation models, in order to capture the dynamics of the relationship between media multitasking and cognitive performance more comprehensively. In addition, the use of behavioral or experimental measurement approaches such as digital activity tracking or neurocognitive assessments may enhance the validity of findings and deepen understanding of the cognitive mechanisms involved (Feng, 2013; Uncapher & Wagner, 2018).

CONCLUSIONS

This study concludes that media multitasking tends to be weakly associated with reduced verbal processing efficiency among university students. Although the relationship is not statistically significant, the observed negative tendency suggests that simultaneous media use may interfere with the allocation of attentional resources required for efficient verbal processing. These findings indicate that media multitasking represents one contributing factor within a broader constellation of cognitive influences on academic learning. Therefore, digital learning practices should promote mindful media use and strategies that support sustained attention and high-quality verbal information processing.

ACKNOWLEDGMENT

The authors would like to express their sincere gratitude to all parties who supported the implementation of this research. Special thanks are extended to the students who willingly participated as respondents and provided data that were essential to the completion of this study. The authors also appreciate the academic support received throughout the research design, data collection, analysis, and manuscript preparation stages. All views, analyses, and conclusions presented in this article are the sole responsibility of the authors.

AUTHOR CONTRIBUTIONS STATEMENT

The author is fully responsible for all stages of the research, including the formulation of the research concept and design, instrument development, data collection and analysis, as well as the writing and revision of the manuscript. The author has read and approved the final version of the manuscript for publication.

REFERENCES

Alzahabi, R., & Becker, M. W. (2013). The association between media multitasking, task-switching, and dual-task performance. *Journal of Experimental Psychology: Human Perception and Performance*, *39*(5), 1485–1495. https://doi.org/10.1037/a0031208

Ayres, P., & Sweller, J. (2014). The split-attention principle in multimedia learning. *The Cambridge Handbook of Multimedia Learning*, 206–226. https://doi.org/10.1017/CBO9781139547369.011

Baddeley, A. (2012). Working Memory: Theories, Models, and Controversies. *Annual Review of Psychology*, *63*(Volume 63, 2012), 1–29. https://doi.org/10.1146/annurev-psych-120710-100422

Biasutti, M. (2011). The student experience of a collaborative e-learning university module. *Computers & Education*, *57*(3), 1865–1875. https://doi.org/10.1016/j.compedu.2011.04.006

Brasel, S. A., & Gips, J. (2011). Media Multitasking Behavior: Concurrent Television and Computer Usage. *Cyberpsychology, Behavior and Social Networking*, *14*(9), 527–534. https://doi.org/10.1089/cyber.2010.0350

Cain, M. S., Leonard, J. A., Gabrieli, J. D. E., & Finn, A. S. (2016). Media multitasking in adolescence. *Psychonomic Bulletin & Review*, *23*(6), 1932–1941. https://doi.org/10.3758/s13423-016-1036-3

Carrier, L. M., Rosen, L. D., Cheever, N. A., & Lim, A. F. (2015). Causes, effects, and practicalities of everyday multitasking. *Developmental Review*, *35*, 64–78. https://doi.org/10.1016/j.dr.2014.12.005

Chen, Q., & Yan, Z. (2016). Does multitasking with mobile phones affect learning? A review. *Computers in Human Behavior*, *54*, 34–42. https://doi.org/10.1016/j.chb.2015.07.047

Creswell, J. W. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (5th ed.). SAGE Publications.

Draheim, C., Pak, R., Draheim, A. A., & Engle, R. W. (2022). The role of attention control in complex real-world tasks. *Psychonomic Bulletin & Review*, *29*(4), 1143–1197. https://doi.org/10.3758/s13423-021-02052-2

Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving Students' Learning With Effective Learning Techniques: Promising Directions From Cognitive and Educational Psychology. *Psychological Science in the Public Interest*, *14*(1), 4–58. https://doi.org/10.1177/1529100612453266

Farley, J., Risko, E., & Kingstone, A. (2013). Everyday attention and lecture retention: The effects of time, fidgeting, and mind wandering. *Frontiers in Psychology*, *4*. https://doi.org/10.3389/fpsyg.2013.00619

Feng, S., D'Mello, S., & Graesser, A. C. (2013). Mind wandering while reading easy and difficult texts. *Psychonomic Bulletin & Review*, *20*(3), 586–592. https://doi.org/10.3758/s13423-012-0367-y

Field, A.P. (2018). *Discovering Statistics Using IBM SPSS Statistics. 5th Edition, Sage, Newbury Park. - References—Scientific Research Publishing*.

Firth, J., Torous, J., Stubbs, B., Firth, J. A., Steiner, G. Z., Smith, L., Alvarez-Jimenez, M., Gleeson, J., Vancampfort, D., Armitage, C. J., & Sarris, J. (2019). The "online brain": How the Internet may be changing our cognition. *World Psychiatry*, *18*(2), 119–129. https://doi.org/10.1002/wps.20617

Fraenkel, J. R., & Wallen, N. E. (2019). *How to Design and Evaluate Research in Education (7th ed.). McGraw Hill Higher Education. - References—Scientific Research Publishing*.

Grosch, M. (2013). *Media Use in Higher Education from a Cross-National Perspective*. *11*(3).

Hadar, A., Hadas, I., Lazarovits, A., Alyagon, U., Eliraz, D., & Zangen, A. (2017). Answering the missed call: Initial exploration of cognitive and electrophysiological changes associated with smartphone use and abuse. *PLOS ONE*, *12*(7), e0180094. https://doi.org/10.1371/journal.pone.0180094

Junco, R. (2015). Student class standing, Facebook use, and academic performance. *Journal of Applied Developmental Psychology*, *36*, 18–29. https://doi.org/10.1016/j.appdev.2014.11.001

Junco, R., & Cotten, S. R. (2012). No A 4 U: The relationship between multitasking and academic performance. *Computers & Education*, *59*(2), 505–514. https://doi.org/10.1016/j.compedu.2011.12.023

Just, M. A., & Carpenter, P. A. (1992). A capacity theory of comprehension: Individual differences in working memory. *Psychological Review*, *99*(1), 122–149. https://doi.org/10.1037/0033-295X.99.1.122

Kahne, J., & Bowyer, B. (2017). Educating for Democracy in a Partisan Age: Confronting the Challenges of Motivated Reasoning and Misinformation. *American Educational Research Journal*, *54*(1), 3–34. https://doi.org/10.3102/0002831216679817

Kahneman, D. (1973). *Attention and effort*. Prentice-Hall, Inc.

Kane, M. J., Smeekens, B. A., von Bastian, C. C., Lurquin, J. H., Carruth, N. P., & Miyake, A. (2017). A combined experimental and individual-differences investigation into mind wandering during a video lecture. *Journal of Experimental Psychology: General*, *146*(11), 1649–1674. https://doi.org/10.1037/xge0000362

Kirschner, P. A., & Karpinski, A. C. (2010). Facebook® and academic performance. *Computers in Human Behavior*, *26*(6), 1237–1245. https://doi.org/10.1016/j.chb.2010.03.024

Konishi, M., McLaren, D. G., Engen, H., & Smallwood, J. (2015). Shaped by the Past: The Default Mode Network Supports Cognition that Is Independent of Immediate Perceptual Input. *PLOS ONE*, *10*(6), e0132209. https://doi.org/10.1371/journal.pone.0132209

Kuznekoff, J. H., Munz, S., & Titsworth, S. (2015). Mobile phones in the classroom: Examining the effects of texting, Twitter, and message content on student learning. *Communication Education*, *64*(3), 344–365. https://doi.org/10.1080/03634523.2015.1038727

Li, J., Kizilcec, R., Bailenson, J., & Ju, W. (2016). Social robots and virtual agents as lecturers for video instruction. *Computers in Human Behavior*, *55*, 1222–1230. https://doi.org/10.1016/j.chb.2015.04.005

Loh, K. K., & Kanai, R. (2014). Higher Media Multi-Tasking Activity Is Associated with Smaller Gray-Matter Density in the Anterior Cingulate Cortex. *PLoS ONE*, *9*(9), e106698. https://doi.org/10.1371/journal.pone.0106698

Madore, K. P., Khazenzon, A. M., Backes, C. W., Jiang, J., Uncapher, M. R., Norcia, A. M., & Wagner, A. D. (2020). Memory failure predicted by attention lapsing and media multitasking. *Nature*, *587*(7832), 87–91. https://doi.org/10.1038/s41586-020-2870-z

Marty-Dugas, J., Ralph, B. C. W., Oakman, J. M., & Smilek, D. (2018). The relation between smartphone use and everyday inattention. *Psychology of Consciousness: Theory, Research, and Practice*, *5*(1), 46–62. https://doi.org/10.1037/cns0000131

May, K. E., & Elder, A. D. (2018). Efficient, helpful, or distracting? A literature review of media multitasking in relation to academic performance. *International Journal of Educational Technology in Higher Education*, *15*(1), 13. https://doi.org/10.1186/s41239-018-0096-z

McVay, J. C., & Kane, M. J. (2012). Why Does Working Memory Capacity Predict Variation in Reading Comprehension? On the Influence of Mind Wandering and Executive Attention. *Journal of Experimental Psychology. General*, *141*(2), 302–320. https://doi.org/10.1037/a0025250

Minear, M., Brasher, F., McCurdy, M., Lewis, J., & Younggren, A. (2013). Working memory, fluid intelligence, and impulsiveness in heavy media multitaskers. *Psychonomic Bulletin & Review*, *20*(6), 1274–1281. https://doi.org/10.3758/s13423-013-0456-6

Moghaddam, F. M., & Hendricks, M. J. (2020). The psychology of revolution. *Current Opinion in Psychology*, *35*, 7–11. https://doi.org/10.1016/j.copsyc.2020.02.004

Montag, C., & Diefenbach, S. (2018). Towards Homo Digitalis: Important Research Issues for Psychology and the Neurosciences at the Dawn of the Internet of Things and the Digital Society. *Sustainability*, *10*(2), 415. https://doi.org/10.3390/su10020415

Ophir, E., Nass, C., & Wagner, A. D. (2009). Cognitive control in media multitaskers. *Proceedings of the National Academy of Sciences*, *106*(37), 15583–15587. https://doi.org/10.1073/pnas.0903620106

Paas, F., & Sweller, J. (2014). *Implications of Cognitive Load Theory for Multimedia Learning (Chapter 6)—The Cambridge Handbook of Multimedia Learning*.

Pallant, J. (2020). *SPSS Survival Manual A Step by Step Guide to Data Analysis Using IBM SPSS. London McGraw-Hill, Open University Press. - References—Scientific Research Publishing*. https://doi.org/10.4324/9781003117452

Parry, D. A., & Le Roux, D. B. (2019). Media multitasking and cognitive control: A systematic review of interventions. *Computers in Human Behavior*, *92*, 316–327. https://doi.org/10.1016/j.chb.2018.11.031

Pashler, H. (1994). Dual-task interference in simple tasks: Data and theory. *Psychological Bulletin*, *116*(2), 220–244. https://doi.org/10.1037/0033-2909.116.2.220

Perfetti, C. A., & Stafura, J. (2014). *Word Knowledge in a Theory of Reading Comprehension: Scientific Studies of Reading: Vol 18, No 1*. https://doi.org/10.1080/10888438.2013.827687

Ralph, B. C. W., Thomson, D. R., Cheyne, J. A., & Smilek, D. (2014). Media multitasking and failures of attention in everyday life. *Psychological Research*, *78*(5), 661–669. https://doi.org/10.1007/s00426-013-0523-7

Rideout, V. J., Foehr, U. G., & Roberts, D. F. (2010). Generation M[superscript 2]: Media in the Lives of 8- to 18-Year-Olds. Dalam *Henry J. Kaiser Family Foundation*.

Rioja, K., Cekic, S., Bavelier, D., & Baumgartner, S. (2023). Unravelling the link between media multitasking and attention across three samples. *Technology, mind, and behavior*, *4*(2), https://doi.org/10.1037/tmb0000106

Risko, E. F., & Gilbert, S. J. (2016). Cognitive Offloading. *Trends in Cognitive Sciences*, *20*(9), 676–688. https://doi.org/10.1016/j.tics.2016.07.002

Rosen, L. D. (2017). The Distracted Student Mind—Enhancing Its Focus and Attention. *Phi Delta Kappan*, *99*(2), 8–14. https://doi.org/10.1177/0031721717734183

Sana, F., Weston, T., & Cepeda, N. J. (2013). Laptop multitasking hinders classroom learning for both users and nearby peers. *Computers & Education*, *62*, 24–31. https://doi.org/10.1016/j.compedu.2012.10.003

Schneider, S., Nebel, S., Beege, M., & Rey, G. D. (2018). The autonomy-enhancing effects of choice on cognitive load, motivation and learning with digital media. *Learning and Instruction*, *58*, 161–172. https://doi.org/10.1016/j.learninstruc.2018.06.006

Sweller, J., Ayres, P., & Kalyuga, S. (2019). *Cognitive Load Theory. Springer, New York. - References—Scientific Research Publishing*. https://doi.org/10.4324/9780429283895-1

Szumowska, E., Popławska-Boruc, A., Kuś, J., Osowiecka, M., & Kramarczyk, J. (2018). When frequent media multitaskers perform worse and when they do not: The role of self-regulation ability and strategy manipulation. *Computers in Human Behavior*, *83*, 184–193. https://doi.org/10.1016/j.chb.2018.01.043

Uncapher, M. R., K. Thieu, M., & Wagner, A. D. (2016). Media multitasking and memory: Differences in working memory and long-term memory. *Psychonomic Bulletin & Review*, *23*(2), 483–490. https://doi.org/10.3758/s13423-015-0907-3

Uncapher, M. R., & Wagner, A. D. (2018). Minds and brains of media multitaskers: Current findings and future directions. *Proceedings of the National Academy of Sciences*, *115*(40), 9889–9896. https://doi.org/10.1073/pnas.1611612115

Unsworth, N., & McMillan, B. D. (2013). Mind wandering and reading comprehension: Examining the roles of working memory capacity, interest, motivation, and topic experience. *Journal of Experimental Psychology. Learning, Memory, and Cognition*, *39*(3), 832–842. https://doi.org/10.1037/a0029669

Winneke A. van der Schuur, W. A., Baumgartner, S. E., Sumter, S. R., & Valkenburg, P. M. (2015). The consequences of media multitasking for youth: A review. *Computers in Human Behavior*, *53*. https://doi.org/10.1016/j.chb.2015.06.035

Wilmer, H. H., Sherman, L. E., & Chein, J. M. (2017). Smartphones and Cognition: A Review of Research Exploring the Links between Mobile Technology Habits and Cognitive Functioning. *Frontiers in Psychology*, *8*, 605. https://doi.org/10.3389/fpsyg.2017.00605

Wiradhany, W., & Koerts, J. (2021). Everyday functioning-related cognitive correlates of media multitasking: A mini meta-analysis. *Media Psychology*, *24*(2), 276–303. https://doi.org/10.1080/15213269.2019.1685393

Wiradhany, W., & Mark R Nieuwenstein. (2017). *Cognitive control in media multitaskers: Two replication studies and a meta-Analysis—PubMed*. https://doi.org/10.3758/s13414-017-1408-4

Xie, B., Charness, N., Fingerman, K., Kaye, J., Kim, M. T., & Khurshid, A. (2020). When Going Digital Becomes a Necessity: Ensuring Older Adults' Needs for Information, Services, and Social Inclusion During COVID-19. *Journal of Aging & Social Policy*, *32*(4–5), 460–470. https://doi.org/10.1080/08959420.2020.1771237