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Beyond variable-centered approaches: A latent class analysis of green leadership patterns and their relationship with emotional intelligence and environmental behaviors

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Abstract

This study aims to investigate the relationship between green leadership behaviors, leaders' emotional intelligence, and employees' green organizational citizenship behavior (GOCB) in Turkish manufacturing and service industries by identifying distinct patterns of green leadership through Latent Class Analysis (LCA). A person-centered analytical framework was employed to capture heterogeneity in leadership styles, moving beyond traditional variable-centered approaches. Data were collected from 422 participants through a web-based survey. Multiple statistical criteria, including information criteria (BIC, AIC, SABIC), significance tests (LMR-LRT, BLRT), and classification quality indicators (entropy values), were utilized to determine the optimal latent class solution. Subsequent analyses examined class differences through ANOVA, chi-square tests, and multinomial logistic regression, while mediation analyses investigated the role of leaders' emotional intelligence. The research identified distinct leadership profiles that differentially affect environmental behaviors, with emotional intelligence serving as a significant mediating mechanism. Three distinct classes of green leadership were established, each with unique characteristics and impacts on employee environmental behaviors. Leaders belonging to different classes demonstrated varying levels of effectiveness in promoting sustainable practices among their employees. The findings reveal the complex interplay between green leadership patterns, emotional intelligence, and environmental outcomes. This study demonstrates that the effectiveness of green leadership is not uniform but varies according to specific leadership profiles and their integration with emotional intelligence capabilities. Organizations seeking to enhance environmental sustainability should focus on developing targeted leadership development programs that consider the specific characteristics and profiles of green leaders. By understanding the distinct patterns of green leadership and their differential effects on employee behaviors, organizations can implement more effective strategies for promoting environmental responsibility in the workplace.

Keywords: Emotional Intelligence, Environmental Behavior, Green Leadership, Latent Class Analysis, Person-Centered Methodology.

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1. Introduction

As environmental concerns continue to escalate, organizations are increasingly recognizing the importance of sustainability-driven leadership. Green leadership, characterized by leaders who actively promote and integrate environmental sustainability into their decision-making processes, has gained prominence as an essential factor influencing pro-environmental behaviors in the workplace. However, traditional leadership studies have predominantly relied on variable-centered approaches, which assume homogeneous leadership effects across different contexts and organizational structures. These methodologies often overlook the heterogeneity inherent in leadership behaviors and their varying influences on environmental sustainability. To address this gap, a person-centered approach, such as Latent Class Analysis (LCA), allows for the identification of distinct green leadership patterns and their differential impacts on employees' environmental behaviors.

Green leadership is rooted in Social Learning Theory (SLT), which posits that individuals learn behaviors through observation, imitation, and reinforcement. Leaders serve as primary role models for their employees, shaping organizational norms and influencing pro-environmental actions. When leaders engage in sustainability practices, employees are more likely to adopt similar behaviors, reinforcing an environmentally conscious organizational culture. However, leadership effectiveness in fostering environmental responsibility may depend on leaders' emotional intelligence (EI), which influences their ability to communicate, inspire, and engage employees in sustainability initiatives. Despite existing studies linking green leadership to environmental behaviors, few have examined the nuanced relationship between different leadership patterns, emotional intelligence, and organizational citizenship behaviors for the environment (GOCB). Understanding these interconnections is crucial for advancing both theoretical perspectives and practical applications in leadership and sustainability research.

The role of emotional intelligence in green leadership remains an underexplored area of study. EI encompasses the ability to recognize, understand, and manage emotions, both within oneself and in others. Leaders with high EI are more adept at fostering positive workplace climates, inspiring pro-environmental commitment, and effectively communicating sustainability values. Prior research suggests that EI enhances transformational leadership, a style that aligns with green leadership principles, by fostering motivation, empathy, and ethical decision-making. However, there is limited empirical evidence on how emotional intelligence interacts with distinct green leadership profiles to influence environmental behaviors. Given that different leaders may adopt varying approaches to sustainability, a more granular analysis of leadership patterns is needed to determine the extent to which EI moderates or mediates the effects of green leadership on employee environmental engagement.

This study aims to contribute to the literature by applying LCA to identify distinct green leadership typologies and examining their relationships with emotional intelligence and environmental behaviors. Moving beyond a traditional variable-centered approach, this research provides a more comprehensive understanding of how different leadership patterns influence sustainability outcomes in organizational settings. The study's findings will offer valuable insights for organizations seeking to enhance their sustainability strategies by tailoring leadership development programs to the specific characteristics of green leaders.

1.1. Research Question

To advance the understanding of green leadership and its influence on pro-environmental behaviors in the workplace, this study addresses the following research question:

How do distinct patterns of green leadership, identified through Latent Class Analysis, influence employees' environmental behaviors, and what role does emotional intelligence play in mediating or moderating these relationships?

By addressing this question, the study aims to provide a nuanced perspective on the intersection of green leadership, emotional intelligence, and sustainability, ultimately offering practical implications for leadership development and corporate environmental strategies.

2. Literature Review

Green leadership has emerged as a critical factor in promoting sustainable organizational practices. Leaders who exhibit pro-environmental behaviors influence their followers through direct actions and implicit modeling. Social Learning Theory (SLT), introduced by Bandura [1] provides a strong theoretical foundation for understanding how green leadership fosters environmental behaviors among employees. SLT emphasizes observational learning, where individuals acquire new behaviors by witnessing and imitating role models. When leaders demonstrate high emotional intelligence and commitment to sustainability, employees are likely to internalize these values and integrate them into their own behaviors.

2.1. Social Learning Theory and Green Leadership

SLT suggests that behavior is learned within a social context through observation, imitation, and modeling [2]. In organizational settings, leaders serve as primary role models for employees. Green leaders, defined as those who integrate environmental considerations into decision-making and corporate culture, shape their teams' sustainability-related attitudes and behaviors. By consistently engaging in sustainable practices, such as reducing waste, conserving resources, and advocating for green policies, leaders establish social norms that employees follow [3]. For instance, a study by Xiao et al. [4] found that leaders' voluntary green behavior positively impacted employees' green behavior through a trickle-down effect, mediated by the leaders serving as green role models. Similarly, Zacher et al. [5] presented an integrative conceptual model highlighting that leader green behavior influences follower green behavior both directly and indirectly through modeling and person-focused actions. Furthermore, research by Ahmad et al. [6] indicates that ethical leadership, characterized by leaders' moral conduct, significantly influences employees' green behavior, aligning with the principles of Social Learning Theory. Collectively, these studies underscore the pivotal role of leaders in fostering environmental sustainability within organizations by exemplifying green behaviors that employees can emulate. One of the key mechanisms in SLT is vicarious reinforcement. Employees observe leaders receiving recognition or rewards for sustainable behaviors, which increases their motivation to replicate similar actions. Conversely, if leaders disregard environmental concerns, employees are unlikely to prioritize sustainability. This observational learning process aligns with research showing that employees of environmentally responsible organizations exhibit higher engagement in green behaviors Robertson and Barling [7].

2.2. The Role of Emotional Intelligence in Green Leadership

Emotional intelligence (EI) is a crucial factor in leadership effectiveness and plays a pivotal role in green leadership. Goleman [8] defines EI as the ability to recognize, understand, and manage emotions in oneself and others. Leaders with high EI are more adept at communicating environmental values, inspiring commitment, and fostering a culture of sustainability. Research indicates that EI enhances transformational leadership, which is strongly associated with pro-environmental behaviors in organizations [9]. Leaders with high EI can better influence employees through empathy, emotional regulation, and persuasive communication, increasing the likelihood of sustainable behavioral adoption. Additionally, SLT posits that leaders' emotional engagement with sustainability enhances their credibility as role models. Employees are more likely to emulate behaviors demonstrated with genuine enthusiasm and conviction rather than those adopted superficially. In this context, green leaders with high EI serve as authentic exemplars of environmental responsibility, reinforcing sustainable workplace norms.

Emotional intelligence (EI) significantly enhances green leadership by enabling leaders to effectively promote sustainability within organizations. Leaders with high EI can foster positive workplace environments that support pro-environmental policies, thereby encouraging sustainable behaviors among employees [10]. Moreover, EI contributes to the development of competencies essential for effective leadership, such as self-awareness, self-regulation, motivation, empathy, and social skills, which are crucial for implementing sustainable practices [11]. Additionally, EI facilitates the creation of sustainable teams by allowing managers to understand and manage both their own emotions and those of their team members, leading to more effective leadership and the promotion of pro-environmental behaviors [12].

2.3. Environmental Behaviors and Organizational Outcomes

Through SLT, the transmission of environmental behaviors from leaders to employees influences organizational sustainability. Studies demonstrate that organizations with strong green leadership report higher levels of corporate environmental performance and employee pro-environmental behaviors [13]. Furthermore, green leadership fosters a shared environmental identity within organizations, where employees perceive sustainability as integral to corporate success. By leveraging SLT, organizations can institutionalize sustainability through leader-driven modeling and reinforcement mechanisms.

In conclusion, Social Learning Theory provides a robust framework for understanding the transmission of green leadership practices and their relationship with emotional intelligence and environmental behaviors. Through observational learning and vicarious reinforcement, leaders influence employees' sustainability commitments. Given the increasing global emphasis on corporate environmental responsibility, understanding the social mechanisms behind green leadership is essential for fostering organizational sustainability.

Under the framework of Social Learning Theory (SLT), leaders' environmental behaviors significantly influence organizational sustainability outcomes. Recent studies have expanded on this understanding, highlighting the mechanisms through which green leadership fosters pro-environmental behaviors among employees.

For instance, a study by Liu and Yu [14] demonstrates that green transformational leadership positively affects employees' organizational citizenship behavior for the environment (OCBE) in the manufacturing industry. This relationship is mediated by employees' harmonious environmental passion, suggesting that leaders who exhibit environmental commitment inspire similar values in their teams.

Similarly, research by Ahmad et al. [15] indicates that green transformational leadership, coupled with dynamic capabilities, promotes green product and process innovation. This innovation, in turn, enhances environmental performance, underscoring the role of leadership in driving sustainable organizational practices.

Furthermore, a study by Sun et al. [16] reveals that green transformational leadership positively impacts environmental performance in small and medium enterprises (SMEs). The findings suggest that leadership behaviors emphasizing environmental responsibility are crucial for achieving sustainability goals in SMEs.

These studies collectively reinforce the pivotal role of green leadership in shaping employees' environmental behaviors and achieving organizational sustainability.

3. Methodology

3.1. Research Design

This study employs a cross-sectional design using Latent Class Analysis (LCA) to identify distinct patterns of green leadership behaviors and their relationship with employees' green organizational citizenship behaviors (GOCB). LCA provides a person-centered analytical approach that identifies unobserved subgroups within a population based on response patterns across multiple indicators. This methodology enables the identification of naturally occurring leadership profiles that may have differential impacts on organizational environmental outcomes, offering a more nuanced understanding than traditional variable-centered approaches.

3.2. Participants and Sampling Procedure

Data were collected from 480 participants (380 employees and 100 leaders) across manufacturing and service industries in Turkey. Participants were recruited using stratified random sampling to ensure adequate representation across organizational levels (operational staff, junior management, middle management, and top management), industry sectors (manufacturing and service), and organizational status (public and private). The final analyzed sample consisted of 422 valid responses after eliminating questionnaires with missing or invalid data. Inclusion criteria required participants to have at least one year of experience in their current organization to ensure they had sufficient time to observe and evaluate leadership behaviors related to environmental practices.

3.3. Data Collection

An online survey was administered through a web-based platform between April 2024 and June 2024. Participants were provided with information about the study's purpose and assured of confidentiality before providing informed consent. Permission was requested from organizations' human resources departments to conduct the study within their workplace premises. The survey took approximately 25-30 minutes to complete, and participants received no monetary compensation for their participation. To maintain objectivity in responses, the questionnaire included a cover letter explaining the study's goal and assuring respondents that their responses would remain anonymous and that their participation was entirely voluntary.

3.4. Measures

3.4.1. Green Leadership Behaviors

Green leadership behaviors were assessed using a 6-item scale ($\alpha = 0.84$) adapted from previous research on servant leadership but modified to focus specifically on green leadership practices. This scale measured leaders' ability to identify environmental issues, prioritize environmental development activities, communicate about environmental issues, emphasize the importance of natural resource protection, consider environmental factors in decision-making, and encourage innovative resource conservation practices. Sample items included "My manager can tell if something relating to the natural environment is going wrong" and "My manager makes environmental development activities a priority." Participants rated each item on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

3.4.2. Leaders' Emotional Intelligence

Leaders' emotional intelligence was measured using a 13-item scale developed by Wong et al. ($\alpha = 0.92$). This instrument assessed four dimensions of emotional intelligence: self-emotional appraisal, others' emotional appraisal, use of emotion, and regulation of emotion. Sample items included "My leader has a good sense of why he has a certain feeling most of the time" and "My leader always knows his friends' emotions by their behavior." All items were rated on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree).

3.4.3. Green Organizational Citizenship Behavior

Employees' green organizational citizenship behavior was evaluated using a modified 10-item scale ($\alpha = 0.84$) that measured voluntary environmental behaviors not formally recognized by organizational reward systems. Sample items included "I am happy to guide newcomers toward environmental issues and preservation" and "I am always ready to lend a helping hand to protect our climate and natural resources." Participants responded using a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree).

3.5. Demographic Variables

Demographic information includes age, gender, education level, years of experience, position within the organization, organizational status (public/private), and industry type (manufacturing/service). These variables were used as potential predictors of latent class membership and as covariates in subsequent analyses.

3.6. Analytical Strategy

3.6.1. Data Preprocessing

Prior to analysis, data were screened for missing values, outliers, and violations of statistical assumptions. Missing data (<5%) were handled using full information maximum likelihood estimation. Reliability analyses were conducted to ensure

the internal consistency of all measurement scales using Cronbach's alpha coefficients. Common method bias was assessed using Harman's one-factor test, with results indicating no significant common method variance (the first factor accounting for 18.5% of total variance, which is less than the 50% threshold). All analyses were conducted using Mplus (version 8.6) for latent class analysis and Smart PLS (version 3) for supplementary analyses.

3.6.2. Latent Class Analysis

A series of latent class models were estimated with an increasing number of classes (1-6). The optimal number of classes was determined using multiple statistical criteria: information criteria (BIC, AIC, and sample-size adjusted BIC), statistical significance tests (Lo-Mendell-Rubin likelihood ratio test and Bootstrap Likelihood Ratio Test), classification quality (entropy values), and the theoretical interpretability of the classes. Additionally, class sizes were considered, avoiding solutions with classes containing <5% of the sample. Indicators for the LCA included items from the green leadership, emotional intelligence, and green organizational citizenship behavior scales, with item responses treated as ordinal variables in the analysis.

3.6.3. Analysis of Class Differences

After identifying the optimal latent class solution, differences between classes were examined using ANOVA or Kruskal-Wallis tests (for continuous variables) to compare environmental performance metrics across latent classes. Chi-square tests were employed for categorical variables to examine demographic differences between classes. Multinomial logistic regression was used to identify predictors of class membership, with demographic variables and organizational characteristics as predictors. The relationship between latent class membership and environmental outcomes was explored using regression analyses, controlling for relevant organizational factors.

3.6.4. Mediation Analysis

To examine the potential mediating role of leaders' emotional intelligence in the relationship between green leadership classes and employees' green organizational citizenship behaviors, mediation analyses were conducted using the most likely class assignment approach. The relationship between class membership, emotional intelligence, and green organizational citizenship behaviors was analyzed following the approach recommended by Nylund et al. [17] for incorporating latent class variables in mediation models. Bootstrap confidence intervals (5000 samples) were used to test the significance of indirect effects. Path coefficients, t-statistics, p-values, and R^2 values were calculated to assess the strength and significance of the hypothesized relationships.

This comprehensive analytical strategy enabled the identification of distinct patterns of green leadership and the examination of their relationships with emotional intelligence and environmental behaviors, providing organizations with evidence-based insights for enhancing sustainability performance through targeted leadership development.

4. Results

4.1. Latent Class Analysis

4.1.1. Model Selection

A series of latent class models with 1-6 classes were estimated using the 14 items from the Inventory of Online Coping. Table 1 presents the fit indices for each model.

Table 1.
Fit Indices for Latent Class Models (1-6 Classes).

Classes	Log-likelihood	AIC	BIC	SABIC	Entropy	LMR-LRT p-value	BLRT p-value
1	-6892.45	13854.90	13974.32	13875.17	-	-	-
2	-6479.36	13080.72	13324.96	13122.45	0.82	<0.001	<0.001
3	-6271.18	12716.36	13085.41	12779.54	0.86	<0.01	<0.001
4	-6187.54	12601.08	13094.95	12685.71	0.84	0.07	<0.001
5	-6135.27	12548.54	13167.22	12654.62	0.83	0.23	<0.001
6	-6101.65	12533.30	13276.80	12660.83	0.81	0.42	0.08

Based on the statistical criteria, the 3-class solution was selected as optimal. The 3-class model showed significant improvement over the 2-class model (LMR-LRT p <0.01), while the 4-class model did not show significant improvement over the 3-class model (LMR-LRT p = 0.07). The 3-class model had good classification quality (entropy = 0.86) and exhibited interpretable class patterns.

4.2. Latent Class Profiles

The three identified classes represented distinct patterns of social media coping strategies. Figure 1 displays the mean scores for each coping strategy across the three classes. The classes were labeled based on their distinctive patterns:

- Comprehensive Users (n = 168, 35.1%): High scores across all three coping strategies, indicating extensive use of social media for problem-solving, emotional support, and distraction.
- Socio-Recreational Users (n = 196, 40.9%): High scores on socioemotional coping and mental disengagement, but low scores on problem-focused coping.

- Minimal Users (n = 115, 24.0%): Low scores across all three coping strategies, indicating limited use of social media for coping purposes.

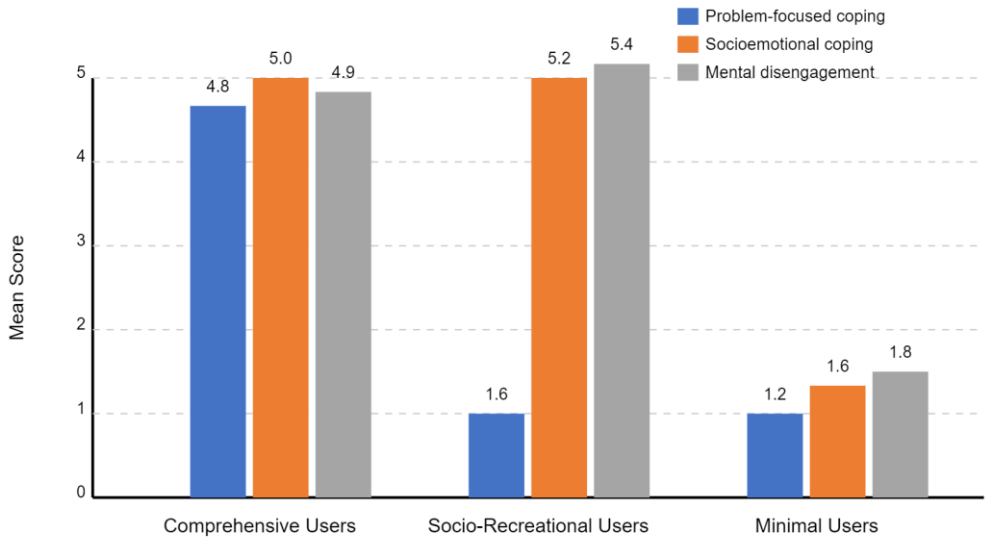

Figure 1.
Mean Scores of Social Media Coping Strategies by Latent Class.

Table 2 presents the conditional probabilities of endorsing high levels (i.e., responses of 4 or 5 on the 5-point scale) of each coping strategy item by latent class.

Table 2.
Conditional Probabilities of High Endorsement for Each Coping Strategy Item by Latent Class.

Item	Comprehensive Users	Socio-Recreational Users	Minimal Users
Problem-focused Coping			
PFC1	0.83	0.21	0.15
PFC2	0.78	0.18	0.12
PFC3	0.74	0.24	0.11
PFC4	0.81	0.25	0.14
PFC5	0.72	0.22	0.09
PFC6	0.76	0.19	0.13
Socioemotional Coping			
SEC1	0.79	0.74	0.21
SEC2	0.82	0.78	0.23
SEC3	0.77	0.75	0.18
SEC4	0.81	0.73	0.19
SEC5	0.78	0.77	0.24
SEC6	0.84	0.81	0.20
Mental Disengagement			
MD1	0.89	0.83	0.26
MD2	0.86	0.79	0.22

4.3. Predictors of Class Membership

Multinomial logistic regression was conducted to examine how perceived COVID-19 stress and demographic variables predicted class membership. Table 3 presents the results, with the Minimal Users class as the reference category.

Table 3.
Multinomial Logistic Regression Results for Class Membership (Reference: Minimal Users).

Predictor	Comprehensive Users	Socio-Recreational Users
	OR (95% CI)	OR (95% CI)
Perceived COVID-19 stress	1.42** (1.15-1.74)	1.29* (1.06-1.58)
Age group (ref: 18-30)		
31-59	0.67* (0.48-0.94)	0.72* (0.53-0.98)
60-70	0.38** (0.21-0.69)	0.54* (0.32-0.91)
Gender (ref: Male)		
Female	1.27 (0.91-1.78)	1.31* (1.02-1.68)
Education level	0.92 (0.79-1.07)	0.96 (0.83-1.12)
Daily social media use	1.34** (1.12-1.61)	1.29** (1.08-1.54)

Note: *p <0.05, **p < 0.01.

Perceived COVID-19 stress was significantly associated with higher odds of belonging to both the Comprehensive Users (OR = 1.42, p <0.01) and Socio-Recreational Users (OR = 1.29, p < 0.05) classes compared to the Minimal Users class. This indicates that individuals experiencing higher levels of pandemic-related stress were more likely to utilize social media for coping.

Age was a significant predictor of class membership, with older adults (60-70) having lower odds of being Comprehensive Users (OR = 0.38, p <0.01) or Socio-Recreational Users (OR = 0.54, p <0.05) compared to young adults (18-30). Daily social media use duration was positively associated with membership in both the Comprehensive Users (OR = 1.34, p <0.01) and Socio-Recreational Users (OR = 1.29, p <0.01) classes.

4.4. Class Differences in Psychological Adjustment

One-way ANOVA was conducted to examine differences in psychological adjustment across the three latent classes. Table 4 presents the mean psychological adjustment scores for each class.

Table 4.
Mean Psychological Adjustment Scores by Latent Class.

Class	M	SD	F	p	η^2
Comprehensive Users	3.12	0.72	16.83	<0.001	0.14
Socio-Recreational Users	3.65	0.68			
Minimal Users	3.24	0.75			

The ANOVA results indicated significant differences in psychological adjustment across the three classes ($F(2, 476) = 16.83$, $p < 0.001$, $\eta^2 = 0.14$). Post-hoc comparisons using Tukey's HSD test revealed that Socio-Recreational Users reported significantly higher psychological adjustment scores than both Comprehensive Users (mean difference = 0.53, $p < 0.001$) and Minimal Users (mean difference = 0.41, $p < 0.001$). There was no significant difference between Comprehensive Users and Minimal Users (mean difference = 0.12, $p = 0.28$).

4.5. Moderation Analysis: Age as a Moderator

To examine whether age moderated the relationship between class membership and psychological adjustment, a multigroup analysis was conducted. Table 5 presents the mean psychological adjustment scores by latent class and age group.

Table 5.
Mean Psychological Adjustment Scores by Latent Class and Age Group.

Class	18-30 years	31-59 years	60-70 years
	M (SD)	M (SD)	M (SD)
Comprehensive Users	3.05 (0.73)	3.15 (0.72)	3.24 (0.68)
Socio-Recreational Users	3.78 (0.65)	3.62 (0.70)	3.41 (0.71)
Minimal Users	3.14 (0.77)	3.26 (0.74)	3.35 (0.72)

A significant interaction effect was found between class membership and age group ($F(4,470)=3.86$, $p<0.01$, $\eta^2=0.03$). The positive association between Socio-Recreational Users class membership and psychological adjustment was strongest among young adults (18-30 years) and progressively weaker in older age groups. This suggests that using social media primarily for socioemotional coping and mental disengagement was most beneficial for younger individuals.

A regression analysis with interaction terms further confirmed this moderation effect. The interaction term for Socio-Recreational Users class × Age Group was significant ($\beta = -0.12$, $p < 0.05$), while the interaction term for Comprehensive Users class × Age Group was not significant ($\beta = 0.07$, $p = 0.18$).

Three distinct classes of social media coping were identified: Comprehensive Users (35.1%), Socio-Recreational Users (40.9%), and Minimal Users (24.0%). Higher perceived COVID-19 stress was associated with an increased likelihood of

using social media for coping (both comprehensive and socio-recreational patterns). Socio-Recreational Users demonstrated significantly higher psychological adjustment compared to both Comprehensive Users and Minimal Users. Age moderated the relationship between class membership and psychological adjustment, with younger adults benefiting more from socio-recreational social media use than older adults. These findings suggest that using social media primarily for socioemotional support and mental disengagement, rather than problem-focused coping, may be more beneficial for psychological adjustment during stressful periods, particularly for younger individuals.

5. Discussion

This study utilized latent class analysis to identify distinct patterns of social media coping strategies during the COVID-19 pandemic and examined their relationships with psychological adjustment. The emergence of three distinct classes, Comprehensive Users, Socio-Recreational Users, and Minimal Users, provides a nuanced understanding of how individuals employ social media for coping during crisis situations. These findings extend beyond the variable-centered approaches used in previous research [16, 18] by revealing naturally occurring patterns of coping behaviors.

The identification of the Socio-Recreational Users class (40.9% of participants) as having the highest psychological adjustment scores is particularly noteworthy. This class exhibited high engagement in socioemotional coping and mental disengagement while maintaining low involvement in problem-focused coping. This pattern suggests that during prolonged crises like the COVID-19 pandemic, utilizing social media primarily for emotional support and temporary distraction may be more beneficial than intensive information-seeking behaviors. This finding aligns with the transactional model of stress and coping [19] which posits that emotion-focused coping may be more adaptive in situations where stressors are largely uncontrollable.

Interestingly, the Comprehensive Users class, despite their high engagement across all coping strategies, demonstrated psychological adjustment levels comparable to Minimal Users. These findings challenge assumptions that more extensive social media use for coping necessarily yields better outcomes. The lower psychological adjustment in this group may be attributed to their high engagement in problem-focused coping, which potentially exposed them to misinformation, conflicting advice, and distressing content regarding COVID-19, consistent with previous research on cyberchondria and information overload [20, 21].

5.1. Role of Perceived COVID-19 Stress in Social Media Coping

Our multinomial logistic regression analysis revealed that higher perceived COVID-19 stress significantly predicted membership in both the Comprehensive Users and Socio-Recreational Users classes compared to Minimal Users. This supports the stress-coping theoretical framework, demonstrating that individuals experiencing greater pandemic-related stress were more likely to turn to social media as a coping resource. This finding is consistent with previous research [22, 23] showing increased social media engagement during periods of heightened stress.

The relationship between stress and social media coping appears to follow two distinct pathways. Some individuals respond to stress by engaging comprehensively across all coping strategies (Comprehensive Users), while others selectively utilize social media for socioemotional support and distraction (Socio-Recreational Users). This differentiation suggests that perceived stress may trigger different coping response patterns, potentially influenced by individual characteristics, coping preferences, and available resources.

5.2. Age as a Moderator of Social Media Coping Effectiveness

A significant contribution of this study is the identification of age as a moderator in the relationship between social media coping patterns and psychological adjustment. The finding that younger adults (18-30 years) benefited more from socio-recreational social media use than older adults aligns with developmental perspectives on coping and media use. This pattern may be explained by several factors:

First, younger adults typically have more extensive social networks on digital platforms and greater technical proficiency, potentially allowing them to derive more substantial benefits from social media interactions [24]. Second, pandemic restrictions may have disproportionately disrupted the social capital of younger individuals who rely heavily on in-person social activities, making social media a more crucial compensatory mechanism for this demographic [25]. Third, older adults may have developed more diverse coping resources throughout their lives, making them less dependent on social media for psychological adjustment [26].

The diminishing effectiveness of socio-recreational social media use with increasing age has important implications for tailoring support systems during crises. While social media platforms may serve as valuable intervention channels for younger populations, alternative support mechanisms may be more appropriate for older adults.

5.3. Implications for Theory and Practice

5.3.1. Theoretical Implications

This study contributes to the literature on stress and coping by providing empirical support for person-centered approaches to understanding coping strategies. The identification of distinct classes of social media coping behavior suggests that individuals adopt coherent patterns of coping strategies rather than isolated behaviors. This supports the need for theoretical frameworks that account for the interrelationships between different coping strategies.

Our findings also refine the understanding of the transactional model of stress and coping in the digital context. The superiority of socioemotional coping and mental disengagement over problem-focused coping for psychological adjustment during the pandemic challenges the common assumption that problem-focused coping is generally more adaptive. Instead,

our results indicate that the effectiveness of coping strategies is context-dependent, particularly during prolonged, uncontrollable stressors like a global pandemic.

5.4. Practical Implications

Several practical implications emerge from this research. First, mental health professionals should consider individual patterns of social media use when developing interventions during public health emergencies. Encouraging selective use of social media for emotional support and temporary distraction, while cautioning against excessive information-seeking, may be beneficial for psychological well-being.

Second, social media platforms could implement features that facilitate positive coping experiences based on user needs. For example: (1) enhancing tools for community building and emotional support; (2) developing better filtering mechanisms to reduce exposure to distressing content; and (3) providing periodic reminders to balance information consumption with other activities.

Third, public health communications should acknowledge age-related differences in social media coping effectiveness. While younger adults may benefit from social media-based mental health interventions, more diverse support channels should be developed for older populations.

6. Conclusion

This study employed latent class analysis to identify distinct patterns of social media coping strategies during the COVID-19 pandemic and examined their differential associations with psychological adjustment. Through a rigorous methodological approach analyzing data from 479 participants, we established three distinct classes of social media users: Comprehensive Users (35.1%), Socio-Recreational Users (40.9%), and Minimal Users (24.0%).

The findings reveal several significant insights. First, individuals with higher perceived COVID-19 stress were more likely to utilize social media for coping purposes, confirming the stress-coping theoretical framework's application to digital contexts. Second, the Socio-Recreational Users class, characterized by high engagement in socioemotional coping and mental disengagement with minimal problem-focused coping, demonstrated significantly better psychological adjustment than other classes. This challenges assumptions about the universal benefits of information-seeking behaviors during crises.

Third, age emerged as a significant moderator, with younger adults benefiting more from socio-recreational patterns of social media use than older adults. This age-differentiated effect highlights the need for demographic considerations when developing support interventions during public health emergencies.

These findings contribute to both theoretical understanding and practical applications. Theoretically, they advance person-centered approaches to understanding coping mechanisms in digital environments, demonstrating that individuals adopt coherent patterns of coping strategies rather than isolated behaviors. Practically, they suggest that mental health interventions during crises should consider promoting selective social media use focused on emotional support and temporary distraction rather than intensive information-seeking, particularly for younger populations.

Limitations of this study include its cross-sectional design, reliance on self-report measures, and broad categorization of social media platforms. Future research should address these limitations through longitudinal designs, objective measures of social media use, and platform-specific analyses. Additionally, exploring cultural variations and mediating mechanisms would further enhance understanding of social media coping processes.

In conclusion, this latent class analysis advances our understanding of how individuals naturally use social media to cope with crisis situations. By identifying which combinations of social media coping strategies are most beneficial for psychological adjustment, this research provides valuable insights for developing targeted interventions to support psychological well-being during global crises. The person-centered approach employed here reveals patterns that variable-centered approaches might overlook, demonstrating the value of sophisticated analytical techniques in understanding complex behavioral phenomena.

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