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### Resilience in the Technological Era in Support of the Sustainability Agenda

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#### Abstract

Digitalization and globalization are transforming local cultures into digital spaces while challenging the sustainability of Madurese cultural identity. This study aims to analyze the forms and mechanisms of cultural resilience among the Madurese community in responding to these changes. A qualitative approach with a multiple case study design was employed through in-depth interviews with 24 purposively selected informants. Data were analyzed using the interactive model of Miles et al., involving data condensation, data display, and conclusion drawing, with validity ensured through triangulation and member checking. The findings reveal five key dimensions of cultural resilience: technological adaptation, transformation of cultural expressions into digital spaces, strengthening of a culture-based economy, cultural filtering mechanisms, and global expansion of cultural identity. Digitalization functions both as a medium for cultural preservation and as an economic opportunity, guided by religious and customary values. Integrating technology with local culture reinforces cultural sustainability and highlights the importance of community-based empowerment policies.

[Digitalisasi dan globalisasi sedang mengubah budaya lokal ke dalam ruang digital sekaligus mengancam keberlanjutan identitas budaya Madura. Penelitian ini bertujuan untuk menganalisis bentuk dan mekanisme ketahanan budaya di kalangan masyarakat Madura dalam menanggapi perubahan-perubahan tersebut. Pendekatan kualitatif dengan desain studi kasus ganda digunakan melalui wawancara mendalam dengan 24 informan yang dipilih secara acak. Data dianalisis menggunakan model interaktif Miles dkk., yakni kondensasi data, penyajian data, dan penarikan kesimpulan, dengan validitas dijamin melalui triangulasi dan verifikasi anggota. Temuan penelitian mengungkap lima dimensi utama ketahanan budaya: adaptasi teknologi, transformasi ekspresi budaya ke ruang digital, penguatan ekonomi berbasis budaya, mekanisme penyaringan budaya, dan perluasan identitas budaya secara global. Digitalisasi berfungsi ganda sebagai media pelestarian budaya dan peluang ekonomi, yang dipandu oleh nilai-nilai agama dan adat. Integrasi teknologi dengan budaya lokal memperkuat keberlanjutan budaya dan menyoroti pentingnya kebijakan pemberdayaan berbasis komunitas.] © The Authors.

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## 1. Introduction

This article on *Madurese Cultural Resilience in the Technology Era in Support of the Sustainability Agenda*, contains three interrelated conceptual components. First, *cultural resilience* refers to a community's capacity to maintain, adapt, and transform its cultural values and identity when faced with external pressures. [1] defines resilience as a process of successful adaptation despite facing severe challenges, while [2] extends this concept to the collective dimension of the community. In the Technology Era, it refers to the contemporary context characterized by massive digitalization, artificial intelligence, and internet penetration into all levels of society. [3] calls this era the *network era. society* that changes the way humans produce, distribute, and consume culture. Third, the phrase *Supporting the Sustainability Agenda* refers to the global commitment in the Sustainable Development Goals (SDGs) established by the United Nations in 2015, specifically SDG 11 on sustainable communities and SDG 4 on quality education [3].

Madurese society faces dual pressures in the era of technological modernization on the one hand, and the necessity of maintaining cultural identity on the other. There are at least several fundamental problems can be identified. Among them is the occurrence of *cultural Displacement* among Madurese youth growing up in a digital ecosystem. Data from the Central Statistics Agency (BPS) (2022) indicates that internet penetration in East Java has reached 76.4%, with the 15–24 age group being the largest users. High exposure to global cultural content has the potential to erode local identity [4]. On the other hand, there is inequality in the use of technology for cultural preservation. The capacity of Madurese communities to utilize digital technology to document and promote local culture is still limited, especially among tradition holders such as traditional leaders and artists man [5]. The final problem concerns the epistemological gap in the study of Madurese cultural resilience, namely the lack of an analytical framework that holistically integrates the dimensions of technology, local culture, and sustainability into a single, coherent study.

This research offers novelty in three aspects. *First*, from an analytical perspective, it positions Madurese culture as *an active agency* negotiating with technology and sustainability agendas, differing from previous studies that tended to position local communities as passive victims of modernization. *Second*, from a conceptual integration perspective, this research combines three research domains that have previously run parallel: community resilience studies, digital culture studies, and sustainability studies. Cultural Framework Sustainability [6] serves as a conceptual bridge connecting the three domains. *Third*, based on the contextual aspect, this study pays special attention to island communities with strong migration traditions, central Islamic values, and a distinctive kinship-based social system characteristics that make the Madurese case a unique and understudied socio-cultural laboratory.

There are several fundamental reasons why this topic is important to study. *First*, demographic reasons; the Madurese ethnic population is estimated at over 15 million, spread widely across Indonesia and forming a dynamic diaspora [7]. *Second*, reasons of policy relevance: Indonesia is implementing the SDGs program, which requires a contextual evidence base. *Third*, reasons of temporal urgency: [8] noted that approximately 40% of the world's 6,700 languages are threatened with extinction due to digital globalization. *Fourth*, reasons of contribution to global discourse: studies from Muslim Island communities such as Madura will enrich global discourse that has been dominated by Western perspectives. *Fifth*, reasons of cultural justice: an inclusive sustainability agenda must ensure that no community is left behind, in line with the spirit of SDGs 10 and 16. This article builds on three complementary theoretical frameworks that form a solid foundation for analysis. The theory of social-ecological resilience developed by [3] serves as the primary foundation for understanding the adaptive capacity of Madurese communities.

Furthermore, Hall's 1990 theory of cultural identity offers a perspective on how cultural identity is not a static, closed entity, but rather a process that is continually produced and reproduced through cultural practices within specific historical contexts and power relations. In the Maduran context, cultural identity is constructed through complex interactions between Islamic values, customary systems, work ethic, and migration experiences that shape the distinctive character of the Madurese people. The final framework, namely the theory of cultural sustainability, serves as an integrative framework linking cultural dimensions with the sustainability agenda. This framework identifies seven narratives regarding the relationship between culture and sustainability, ranging from culture as heritage that must be preserved, culture as development capital, to culture as the foundation for social transformation towards sustainability. In this study, these narratives are used to analyse the position and role of Maduran cultural resilience within the context of the SDGs agenda.

A number of previous studies have made significant contributions to our understanding of the aspects examined in this research, albeit with varying scopes and focuses. [9] in his book *Madura*

*yang Patuh?* An Anthropological Study of Madurese Culture, provides a comprehensive overview of Madurese social structures and cultural values, including the concepts of *jhâbân* (fate), *songennah* (longing for one's hometown), and *abhântal ombhâk asapo' angin* (embracing the waves wrapped in the wind) as expressions of the resilience of the Madurese people. This research serves as a fundamental reference on Madurese cultural capital, though it has not specifically addressed technological and sustainability dimensions. Civil Islam discusses the role of Islam in shaping the identity and adaptive capacity of Indonesian Muslim communities, including the Madurese community. Hefner demonstrates how Islamic values serve as a source of resilience as well as a foundation for negotiating with modernity. These findings are relevant to the context of this study, particularly in understanding the role of the *pesantren* as an adaptive cultural institution. In the field of technology and local culture, research by [10] on social media and cultural identity in Indonesia shows that Indonesians use digital platforms not only as a means of communication, but also as an arena for the expression and negotiation of cultural identity.

Based on the above discussion, it is clear that research into the resilience of Madurese culture in the technological age in support of the sustainability agenda is not only academically relevant but also carries a practical and ethical urgency that cannot be ignored. This article aims to address existing knowledge gaps whilst making a tangible contribution to the development of more equitable and sustainable development policies and practices.

## 2. Method

*multiple case study design. A qualitative approach* was chosen because it is able to capture the complexity, contextuality, and depth of the cultural resilience phenomenon that cannot be reduced to statistical figures [11]. The multiple case study design allows researchers to examine the phenomenon of Madurese cultural resilience in the context of Madura Island, East Java, and the Kalimantan diaspora. Data were collected from two main sources. First, primary data were obtained through in-depth interviews (interview) with 24 purposively selected informants, including Madurese traditional figures, Islamic boarding school administrators, digital culture activists, academics, and young Madurese who are active on digital platforms. Second, secondary data was obtained through document analysis, including local government policies on cultural preservation, Madurese culture-based digital content.

Data analysis was carried out using an interactive analysis model [12] which includes three stages: (1) data condensation, (2) data *display*, and (3) drawing conclusions (*drawing*). Data validity is guaranteed through source triangulation and method triangulation, as well as member checking with key informants.

## 3. Result and Discussion

### 3.1 Resilience of Madurese Society in the Context of Digitalization and Globalization

In the education sector, the use of digital technology is beginning to be integrated into cultural learning, for example through more interactive audiovisual media. However, cultural values are maintained through a selective approach to technology use. Traditions are still practiced in person as part of efforts to maintain cultural authenticity. The community collectively develops adaptation strategies that enable the culture to survive amidst change. Thus, Madurese people are able to maintain a balance between preserving traditional values and utilizing modern technology.

Table 1. Synthesis of Interview and Observation Results

No	Dimensions of Resilience	Interview Results	Observation Results	Interpretation
1	Digital adaptation	Culture recorded & shared	Cultural content increases	Technology adaptation
2	Cultural transformation	Culture on social media	High digital consumption	Changes in practice
3	Cultural economy	Online sales	Digitally active MSMEs	Economic resilience
4	Selectivity of value	Technology is filtered	Tradition remains strong	Cultural protection
5	Global identity	Culture is widely known	Viral content	Cultural globalization

The findings of this study consistently demonstrate that Madurese society has developed a strong capacity to adapt to developments in digital technology. This adaptability is not passive, but rather active and deliberate, with the community consciously integrating technology into existing cultural practices. This is reflected in informants' statements, which reveal that cultural practices

continue to be practiced as usual, but are now also recorded and shared through social media to prevent loss. These statements indicate a collective awareness of the importance of digitalization as a means of preservation, not a threat. This perspective aligns with findings [13], which concluded that local communities in Indonesia that successfully maintain their cultural identity in the digital era are those that position technology as a tool, not an end in itself. Furthermore, [14] explain that adaptability in the context of cultural digitalization encompasses not only technical mastery of digital devices, but also the ability to interpret and contextualize these technologies within socio-cultural life. Madurese society demonstrates both aspects simultaneously. This process is a form of cultural agency that demonstrates the community's internal resilience in the face of globalization.

From a macro perspective, [3] asserts that cultural resilience in the digital era is determined by a society's ability to contextually integrate technology with local values. The field findings of this research support this view, noting that the Madurese community's technological adaptation is not merely instrumental but also hermeneutical, involving a reinterpretation of cultural practices to ensure their survival and development in a constantly changing digital ecosystem. One of the most significant findings of this research is the transformation of cultural expression media from the physical to the virtual realm. Cultural practices such as bull racing, saronen art, and various traditional rituals are now not only performed in person but also represented in digital formats. This phenomenon indicates that cultural space has expanded in dimension, from being local and physical to transboundary and virtual.

This shift is acknowledged by young people in Sumenep, who state that Madurese culture is now more frequently viewed on TikTok or YouTube than at live events. This statement raises a critical question: does this shift in cultural consumption media threaten or strengthen the cultural substance itself? Analysis of field data indicates that this transformation is addictive, not substitutive, meaning that digital platforms exist as supplementary channels, not replacements for traditional forums. This is reinforced by findings [15], which confirm that utilizing digital storytelling is an effective strategy for strengthening cultural sustainability in the digital age. Digital storytelling allows communities to package cultural narratives in formats that appeal to the younger generation without sacrificing the depth of their meaning. In this context, Madurese cultural content on digital platforms is not merely entertainment, but a medium for transmitting values between generations.

Research [16] adds that the transformation of cultural expression into the digital realm actually opens up opportunities for the revitalization of cultures previously threatened with extinction. When a tradition can no longer be maintained solely through oral or face-to-face transmission, digital documentation becomes a safety net that maintains the continuity of collective cultural memory. In the case of Madurese society, the production of cultural content by the younger generation on various digital platforms can be seen as a form of cultural responsibility that organically grows from an awareness of the importance of ancestral heritage.

The link between economics and cultural resilience becomes particularly strong when the economic sustainability of cultural actors directly supports the sustainability of cultural practices themselves. When Madurese batik artisans earn a decent income from online sales, they have an economic incentive to continue producing and transmitting batik skills to the next generation. Thus, the digitalization of the cultural economy serves as a sustainable support mechanism for the preservation of cultural heritage, a symbiotic relationship often overlooked in conventional discourse on cultural preservation. [19] remind us that while digitalization opens up significant economic opportunities, adequate digital literacy and a supporting ecosystem, such as equitable internet access, affordable digital payment systems, and regulations protecting local businesses, are essential for inclusive benefits. The continuously evolving digital infrastructure in Madura is a crucial factor in determining the extent to which this cultural economic potential can be optimized.

The findings of this study reveal a dimension that is often overlooked in studies of cultural resilience, namely the cultural filtering mechanism filtering. Madurese people do not adopt technology haphazardly, but rather through a multi-layered evaluation process based on religious norms and local cultural values. Religious leaders in Sumenep firmly state that technology may be used, but it must be in accordance with religious and cultural values. This statement reflects the existence of a cultural authority that actively functions as a filter against external influence.[20] defines cultural Filtering is an important strategy in maintaining a balance between modernity and tradition. In the context of Madurese society, this mechanism is not merely formal or institutional, but also internalized in the collective consciousness of the community. Islam, as the primary foundation of Madurese social life, serves as the primary reference in this filtering process. Technologies deemed contrary to Islamic values tend to be rejected or their use restricted.

This phenomenon has similarities with the concept put forward namely 'controlled modernity', where traditional communities selectively adopt elements of modernity without losing the foundations of their identity. In contrast to the view that traditionalism is an obstacle to modernization, these findings actually show that selectivity toward technology is an expression of cultural intelligence that has been honed over centuries.

Cultural mechanisms This filtering is also manifested in the educational domain, where the use of digital technology is beginning to be integrated into cultural learning through interactive audiovisual media. However, the introduction of technology into cultural education remains under the supervision and guidance of figures who understand local values. This demonstrates that selectivity operates not only at the individual level but also at the institutional level, forming a cultural governance that is adaptive yet rooted in tradition.

Research [21] on indigenous communities in East Java shows that communities that have cultural mechanisms Communities with strong filtering are actually more resilient to the pressures of globalization than communities that adopt technology completely without filtering. This finding strengthens the argument that selective resistance is a resilience strategy that actually strengthens, rather than weakens, a culture's long-term adaptive capacity.

The fifth dimension of Madurese cultural resilience relates to the ability of local culture to transcend geographical boundaries and reach a global audience. Community leaders in Pamekasan stated that Madurese culture is now more widely known thanks to the presence of digital media. This statement is not merely optimistic, but rather reflects the reality that local cultural content can be easily accessed by anyone worldwide via the internet.

### 3.2 Utilization of Digital Technology in the Preservation and Sustainability of Madurese Culture

This shows the existence of a cultural selection mechanism (*cultural selection mechanism, filtering*) in the use of digital technology. In line with his statement the success of digitalization in culture is highly dependent on the community's ability to adapt technology to local cultural values. The following is a mapped synthesis of the interview results.

Table 2. Synthesis of Interview Results

No	Aspect	Interview Findings	Meaning	Impact
1	Digitalization of culture	Digital documentation and publication	Changes in conservation patterns	Cultural preservation
2	Digital economy	Online sales	Economic transformation	Economic sustainability
3	Cultural education	Digital learning media	Increased literacy	Transfer of value
4	Cultural identity	Culture in digital space	Cultural globalization	Strengthening identity
5	Cultural values	Technology selection	Selective adaptation	Cultural resilience

Field research conducted in four regions of Madura Bangkalan, Sampang, Pamekasan, and Sumenep reveals a comprehensive picture of how digital technology has become a strategic instrument in the preservation and sustainability of Madurese culture. Data collected through in-depth interviews with various elements of society, including cultural practitioners, businesspeople, educators, young people, community leaders, and religious figures, demonstrates that the use of digital technology is no longer merely an option but a necessity that is increasingly ingrained in the cultural practices of Madurese society.

These findings position Madurese society not as passive objects of global digitalization, but as active subjects who consciously and selectively utilize technology for cultural purposes they deem important. The following analysis will unpack three main themes emerging from the field data: cultural digitalization as a means of preservation, strengthening a culture-based economy through digital platforms, and reshaping cultural identity in the digital space, along with a synthesis of findings from relevant previous research.

The most consistent finding emerging from all research areas is the use of digital technology as a primary medium for documenting and distributing Madurese cultural practices. Cultural actors in Bangkalan explicitly expressed a paradigm shift in how they preserve their culture:

*"Cultural activities are now not only carried out live, but are also recorded and disseminated through digital media to keep them known."*

This statement indicates a growing awareness within the community about the urgency of digital documentation as a safety net for cultural survival. This awareness is not born solely from external pressure, but rather an organic response to the reality that face-to-face cultural transmission faces increasingly complex challenges in the modern era, from changing lifestyles of the younger generation to urbanization, which has resulted in population migration from rural to urban areas.

This finding aligns with the argument [1], which concluded that local actors who successfully maintain their cultural existence in the digital era are those who are able to strategically and contextually integrate cultural values with technology. This integration is not simply a format shift from analog to digital, but rather an adaptation process that maintains the essence of the culture while adapting the delivery medium to the preferences and habits of the contemporary generation.

Furthermore, [22] emphasized that digitalization plays a significant role in strengthening cultural sustainability through technology-based innovation. This innovation concerns not only technical aspects, but also innovations in narrative strategies, content packaging, and the selection of appropriate platforms to reach the target audience segment. In the context of Madurese society, this innovation is evident in the way the younger generation packages traditions such as bull racing or saronen art in an engaging short content format on TikTok and YouTube platforms, thus making them relevant to young audiences without sacrificing their cultural substance.

literacy dimension is a crucial aspect that influences these findings. Educators in Sampang revealed how digital technology has transformed the cultural learning process in the classroom: "*The use of digital media helps students understand local culture more easily.*"

This statement is supported by students' confessions that cultural content on social media has made them more aware of and appreciative of their own culture. This phenomenon reflects how digital technology creates intergenerational bridges in the transmission of cultural values. [23] in their research on technology integration in character education found that the use of pedagogically designed digital media has been proven to increase cultural awareness and strengthen students' local identities more effectively than conventional approaches alone. [24] added that the use of digital platforms can expand the reach of cultural preservation through more effective documentation and distribution. This is relevant to the reality on the ground, where cultural content production by Madurese communities is no longer limited to formal institutions such as local governments or cultural institutions, but has spread to the individual and small community levels. This democratization of content production, on the one hand, accelerates the process of cultural dissemination, but on the other hand, also requires curation and validation mechanisms to ensure the quality and accuracy of disseminated cultural representations.

From a theoretical perspective, the phenomenon of cultural digitalization occurring in Madura can be understood within the framework of the theory of "cultural mediation," which posits that every communication medium not only functions as a channel but also shapes and influences the message conveyed. When Madurese culture is mediated through digital platforms, a process of negotiation occurs between the cultural characteristics of the original culture and the logic of the algorithm and the preferences of the platform in question. Understanding the dynamics of this negotiation is what distinguishes communities that successfully preserve their culture meaningfully in the digital space from those that merely have a digital presence without strong cultural substance.

[18] in their study on the digitalization of intangible cultural heritage in Indonesia emphasize the importance of a (community centered approach) in the process of digitizing culture. This approach prioritizes the active involvement of tradition-holding communities in every stage of the digitization process, from planning to distribution, so that the resulting results truly represent the culture authentically and receive legitimacy from the communities of origin.

The economic dimension is one area where the impact of digital technology on Madurese culture is most concrete and measurable. Field data from Pamekasan and Sumenep reveal a marked transformation in how culture-based entrepreneurs operate and develop their businesses. A batik entrepreneur in Pamekasan stated, "*Products like batik can now be sold online, so their reach is broader than before.*" Meanwhile, culinary entrepreneurs in Sumenep added: "*Promotion through social media is very helpful in attracting consumers.*"

These two statements collectively illustrate the ongoing transformation of Madura's cultural economic ecosystem. While previously marketing cultural products relied heavily on local networks and traditional markets with limited geographic reach, digital platforms have now broken down these geographical barriers and opened up access to national and even international markets. [25] specifically stated that digitalization can increase the competitiveness of culture-based businesses through broader market access and distribution efficiency. This finding is confirmed by research field data, where UMKM actively utilizing e-commerce and social media platforms reported significant

increases in sales volume and consumer reach compared to before they switched to digital marketing strategies.

From a development economics perspective, strengthening culture-based UMKM through digitalization has implications far beyond mere financial aspects. When batik artisans, traditional culinary makers, or cultural artists earn a decent income from their cultural activities, they have a strong economic incentive to continue practicing and transmitting those skills to the next generation. Thus, economic sustainability and cultural sustainability become two sides of the same coin, mutually supporting and reinforcing each other.

However, [9] cautioned against the importance of maintaining a balance between digital innovation and local cultural values during commercialization. This warning is particularly relevant in the context of Madurese culture, where commercial pressures could lead to the simplification or vulgarization of cultural elements to increase market appeal. For example, Madurese batik motifs, rich in philosophical meaning, risk being degraded into mere decorative patterns devoid of cultural content if the digitalization and commercialization processes are not accompanied by an understanding of and commitment to their values.

From a digital ecosystem development perspective, the sustainability of Madura's culture-based economy also depends heavily on the availability of adequate and equitable digital infrastructure. The disparity in internet access between urban and rural areas in Madura remains a real challenge that needs to be addressed so that the economic benefits of digitalization can be enjoyed inclusively by all cultural actors, not just those residing in urban centers. [26] emphasize that digital inclusivity is a fundamental prerequisite for the success of technology-based cultural economy programs.

The third and perhaps most complex dimension of this research's findings is the process of reshaping Madurese cultural identity within the digital ecosystem. Community leaders in Pamekasan stated that Madurese culture is now developing not only locally but also digitally. This statement has profound implications for how cultural identity is constructed, negotiated, and communicated in an era where the boundaries between physical and virtual spaces are increasingly blurred.

ongoing epistemological shift: how cultural knowledge is constructed and internalized by younger generations is increasingly mediated by digital platform algorithms that determine what content they are exposed to. The implications of this shift need to be critically examined. While the accessibility of cultural information is increasing dramatically, there is a risk that digitally acquired cultural knowledge will be more fragmented and less contextual than knowledge acquired through direct experience and oral transmission within communities.

However, this phenomenon also carries considerable potential.[24] state that digital platforms open up space for the construction of a more dynamic and participatory cultural identity , where the younger generation becomes not only a consumer of culture but also an active producer and curator shaping contemporary cultural narratives. In this process, cultural identity is no longer viewed as a static legacy to be accepted as is, but rather as a living entity that continually negotiates with the context of the times.

#### 4. Conclusion

Based on research results, the cultural resilience of the Madurese people in the face of digitalization and globalization demonstrates an adaptive, multidimensional, and community-based character. This resilience does not develop naturally, but rather through a deliberate, selective adaptation process grounded in strong cultural and religious values. Five main dimensions technological adaptation, transformation of cultural expressions into the digital space, strengthening a culture-based economy, and cultural filtering, and the expansion of global identity function as a unified system that mutually reinforces and maintains cultural sustainability.

Digitalization plays a strategic role in enabling Madurese culture to not only be preserved but also developed. Technology is utilized as a medium for documentation and intergenerational transmission of values, while simultaneously opening up new economic opportunities by strengthening culture-based UMKM. Meanwhile, the community continues to implement a selection mechanism for technology use through *cultural practices. filtering*, so that the adaptation process does not eliminate core cultural values. This process also involves the active participation of various groups in society, thus forming a collective and sustainable pattern of resilience.

Overall, these findings demonstrate that the relationship between tradition and modernity is not contradictory, but can be managed synergistically. With the support of social capital and local wisdom, Madurese communities are able to utilize digital technology as a means to strengthen their

cultural identity and improve their well-being. Recommendations for future researchers include conducting cross-cultural comparative studies to identify similarities and differences in cultural resilience patterns across regions. Furthermore, further research is needed on the role of the younger generation and digital technology in forming cultural innovation and the sustainability of local identity in the global era.

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The authors declare that informed consent has been obtained from all individuals involved in this study, including both the informants and all contributing authors.

### Ethical Approval

This research was approved by the [full name of ethics committee/institution] under approval number [B-1623/Un.31/R/PP.00.9//04/2026]. All participants were informed about the aims of the study, the data collection process, and the intended use of the findings for academic publication. Participation was voluntary, and participants had the right to decline or withdraw at any stage without any negative consequences. Written informed consent was obtained prior to participation. To ensure confidentiality, all identifying information was removed from transcripts and reports, and pseudonyms were used in presenting the data. The researchers stored the data securely and used them solely for research purposes.

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