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Digital Empathy as an Evolving Socio-Technological Construct: A Temporal Evolution Concept Analysis

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Abstract

Introduction: Empathy has traditionally been understood as an embodied and relational process within face-to-face healthcare interactions; however, the rapid integration of digital technologies has transformed the conditions under which empathic engagement occurs. Objective: This study aimed to examine the temporal evolution of digital empathy and to develop a theoretically grounded conceptualization reflecting its transformation across technological eras. Methods: A historical–comparative concept analysis using Temporal Evolution Concept Analysis (TECA) was undertaken to interpret how digital empathy has evolved across technologically mediated healthcare contexts. Drawing on peer-reviewed literature retrieved from the Scopus, ScienceDirect, and CINAHL databases, the analysis involved iterative corpus assembly, temporal segmentation, cross-era comparison, evolution tracing, and conceptual trajectory synthesis. Results: The analysis suggests four interconnected phases of digital empathy: human-centered, mediated, hybrid, and artificial intelligence-mediated empathy. Across these phases, shifts were observed from physical presence to mediated presence, from emotional attunement to digital responsiveness, and from embodiment to virtual embodiment. These transformations appear to reflect broader technological developments, evolving healthcare delivery models, and global disruptions. Conclusion: Rather than a static extension of traditional empathy, digital empathy is proposed as an adaptive, evolving socio-technological construct shaped by changing modes of relational engagement. A conceptual trajectory model is proposed, offering implications for clinical practice, health professional education, digital health policy, and the ethical integration of emerging technologies.

Keywords:
Artificial Intelligence, Empathy, Health Communication, Telemedicine, User-Computer Interface

INTRODUCTION

Empathy has long been recognized as a foundational element of caring within nursing and the health sciences. Traditionally, it has been understood as an embodied, relational, and ethically grounded capacity to understand and respond to others' lived experiences. Within caring science, empathy extends beyond a psychological trait and is viewed as a relational process that sustains therapeutic engagement and humanized care. Foundational theorists have emphasized authentic presence, transpersonal connection, and relational responsiveness as essential dimensions of caring encounters (Watson, 2018). In this context, empathy has historically been situated within face-to-face interactions characterized by immediacy, embodiment, and mutual engagement. Clinical communication research likewise demonstrates its importance in fostering patient trust, satisfaction, adherence, and positive care outcomes (Halldórsdóttir & Hamrin, 1997; Suchman et al., 1997).

However, the rapid integration of digital technologies has significantly transformed healthcare delivery and communication practices. Telehealth platforms, electronic communication systems, and artificial intelligence-driven tools increasingly mediate interactions between healthcare professionals and patients, reshaping traditional assumptions regarding presence, proximity, and relational depth (Suchman et al., 1997). Contemporary scholarship further suggests that digital health ecosystems—including remote care infrastructures, algorithmic systems, and virtual communication platforms—have altered how relational engagement is enacted within healthcare environments.

Within this evolving context, the concept of empathy has expanded into the digital domain. Digital empathy refers to the capacity to perceive, interpret, and respond to emotional and relational cues within technologically mediated environments. It encompasses both human-mediated communication, such as telehealth consultations, and machine-mediated interactions, including conversational agents and affective computing systems (Bickmore & Picard, 2005).

Emerging evidence suggests that digital empathy is increasingly central to maintaining patient-centered care, influencing trust, engagement, and perceived quality of care (Kemp et al., 2020; Lupton, 2015). From a caring science perspective, this shift signals not merely a contextual adaptation but a transformation in the conditions under which relational knowing and being-with occur (Tuppal et al., 2021; Tuppal et al., 2025).

Beyond disciplinary variation, these conceptual inconsistencies reveal a deeper methodological limitation. Existing conceptualizations of digital empathy have largely emerged within isolated disciplinary traditions, each emphasizing different assumptions regarding the nature of empathy, technology, and human interaction. Nursing scholarship predominantly frames digital empathy as an extension of therapeutic caring, whereas human–computer interaction emphasizes computational responsiveness, and communication studies focus on digital interactional competence. Consequently, the literature lacks an integrative framework capable of explaining how these differing conceptualizations emerged, coexist, and evolve across successive technological eras. Existing concept analyses primarily clarify concepts at a single point in time but offer limited capacity to account for historical conceptual transformation. This methodological gap provides the rationale for employing Temporal Evolution Concept Analysis (TECA), which was developed to examine how digital empathy has progressively evolved across changing socio-technological contexts rather than treating it as a static and universally defined construct. Despite the growing importance of digital empathy within healthcare and technologically mediated communication, the concept remains conceptually fragmented and theoretically underdeveloped across disciplines. Existing literature defines digital empathy inconsistently, reflecting divergent epistemological and disciplinary orientations. In nursing and caring science, digital empathy is commonly conceptualized as the extension of traditional empathic practice into virtual environments, emphasizing therapeutic communication, active listening, and relational presence during telehealth interactions (Shore et al., 2018). In contrast, scholarship within human–computer interaction and artificial intelligence often conceptualizes digital empathy as a computational or simulated capability involving affect recognition, conversational agents, and algorithmically generated emotional responsiveness (Bickmore & Picard, 2005). Other studies further frame digital empathy as a digital communication competency associated with online engagement, responsiveness, and user interaction within virtual platforms (Lupton, 2015).

These differing conceptualizations demonstrate that digital empathy is variably understood as a relational process, communication skill, technological function, computational capability, or interactional outcome. As a result, the literature lacks a unified conceptual framework that integrates these diverse perspectives into a coherent understanding of empathy in evolving digital contexts. Moreover, much of the existing scholarship remains context-specific and cross-sectional, focusing primarily on empathy within isolated technological settings such as telehealth, chatbot systems, or online communication platforms, without sufficiently examining how the concept itself has evolved across historical and technological periods.

Consequently, there remains limited understanding of how digital empathy has transformed in response to technological advancement, changing healthcare delivery models, and broader socio-cultural disruptions. This absence of a temporal and developmental perspective constrains theoretical integration and limits the

capacity to conceptualize digital empathy as a dynamic and adaptive socio-technological phenomenon. Addressing this gap requires a historically informed, trajectory-based approach that traces how empathic engagement has been reconfigured across shifting technological environments and relational conditions.

Addressing this gap requires a reconceptualization of digital empathy as an evolving construct shaped by the interplay of relational, technological, and contextual forces. Existing scholarship frequently examines digital empathy within isolated technological settings, such as telehealth communication, chatbot interaction, or online engagement platforms, without integrating these perspectives into a broader developmental framework. As a result, literature provides limited explanation of how empathic processes transform across changing technological and healthcare environments. Without a coherent and trajectory-based understanding, it remains difficult to develop effective training frameworks for healthcare professionals, design ethically responsive digital health technologies, or evaluate empathic quality within virtual care environments. Furthermore, the increasing integration of artificial intelligence into healthcare introduces complex ethical and epistemological questions concerning authenticity, agency, simulation, and the nature of relational care (Budd et al., 2020; Topol, 2019).

From the perspective of the Theory of Communion-in-Caring, empathy may be more appropriately understood not as a static attribute, but as a relational process emerging within evolving conditions of being-with (Tuppal et al., 2021). The shift toward digitally mediated care therefore necessitates an epistemic expansion in which empathy is reconsidered as a technologically situated and co-constructed phenomenon.

Within this context, TECA offers a historically oriented methodological approach for examining conceptual transformation across technological periods. By incorporating temporal segmentation, cross-era comparison, and trajectory synthesis, TECA facilitates a deeper interpretive understanding of how digital empathy may emerge, evolve, and reconfigure itself within changing socio-technological landscapes.

This study aims to examine the temporal evolution of digital empathy using TECA in order to develop a theoretically grounded and historically informed conceptualization that captures its transformation across technological eras. Specifically, the study seeks to map the trajectory of digital empathy from embodied, face-to-face interactions toward mediated, hybrid, and artificial intelligence (AI)-assisted forms of relational engagement. By situating digital empathy within a temporal and socio-technological continuum, the study intends to advance caring science, contribute to interdisciplinary scholarship, and provide a conceptual foundation for clinical practice, professional education, and policy development in increasingly digital healthcare systems (Tuppal et al., 2025).

METHODS

1. Design

This study employed TECA, adopting a historical–comparative methodological approach to examine how digital empathy has developed and transformed over time. TECA is particularly suited for concepts embedded in rapidly evolving socio-technological contexts, as it enables the systematic tracing of conceptual shifts across distinct historical phases. Rather than treating digital empathy as a static construct, this approach conceptualizes it as a dynamic and temporally situated phenomenon, shaped by changes in technological infrastructures, healthcare practices, and communicative modalities.

The design integrates principles of concept analysis with temporal analysis, enabling both the identification of defining attributes and the mapping of their transformations across eras. This dual orientation facilitates a more nuanced understanding of digital empathy as an evolving construct, reflecting transitions from human-centered relational engagement to technologically mediated and AI-assisted forms of interaction. By situating concept development within a temporal trajectory, TECA extends traditional concept analysis methodologies toward a more historically grounded and context-sensitive framework.

2. Data Sources

The analytical corpus for this study was developed through a staged literature retrieval and interpretive selection process appropriate for TECA. In the initial retrieval stage, databases and indexing platforms including Scopus, ScienceDirect, and CINAHL were searched to identify literature related to empathy within digitally mediated healthcare and communication contexts. These sources were selected to capture interdisciplinary perspectives from nursing, health sciences, digital communication, and human–computer interaction. The final literature search and corpus refinement were completed in March 2026.

Search strategies employed combinations of keywords including digital empathy, tele-empathy, virtual care, online empathy, AI empathy, and empathy in telehealth. Boolean operators were used to refine retrieval across databases, while iterative searching allowed additional conceptual terms identified during preliminary analysis to be incorporated into subsequent searches.

Following retrieval, purposive interpretive screening was conducted to identify studies with substantive conceptual relevance to digital empathy. Conceptual relevance was operationalized through explicit discussion of empathic processes, relational communication, emotional responsiveness, therapeutic presence, or human–technology

relational interaction within digitally mediated environments. This stage prioritized literature contributing theoretical, conceptual, or empirical insight into how empathy was defined, enacted, or transformed across technological contexts.

Scopus-indexed literature was prioritized during the final corpus refinement stage as a quality and scholarly relevance filter. However, literature retrieved through ScienceDirect and CINAHL was retained when conceptually significant to the historical and interpretive development of the analysis. This distinction between database retrieval and corpus refinement ensured both interdisciplinary breadth and conceptual rigor.

Studies were included if they: (1) were peer-reviewed scholarly publications; (2) explicitly examined empathy, relational engagement, therapeutic communication, or emotional responsiveness within digitally mediated or technology-assisted contexts; (3) contributed conceptual, theoretical, or empirical insight relevant to the evolution of digital empathy across healthcare or human–technology interaction settings; and (4) were available in English.

Studies were excluded if they focused exclusively on technical system performance, engineering functionality, or biomedical processes without substantive engagement with empathic, relational, communicative, or caring dimensions. Literature lacking a conceptual contribution to empathy within technologically mediated contexts was likewise excluded.

3. TECA Analytical Framework

The analysis followed a five-phase TECA process developed for this study to capture the development and transformation of concepts over time.

Phase 1: Historical Corpus Assembly. The first phase involved constructing a chronologically organized dataset spanning multiple decades. Literature was grouped by publication period, enabling the identification of temporal patterns and shifts. The corpus included studies from healthcare, nursing, communication, and digital technology domains, ensuring a comprehensive representation of how empathy has been conceptualized within both traditional and digital contexts.

Phase 2: Period Segmentation. The corpus was organized into temporal phases through a theoretically informed and inductive segmentation process. Initial period boundaries were guided by major technological and healthcare communication transitions identified in the literature, including the emergence of telecommunication systems, expansion of telehealth infrastructures, proliferation of mobile and virtual care technologies, and integration of artificial intelligence into healthcare interaction. Preliminary review of the corpus further demonstrated observable shifts in how empathy was conceptualized, enacted, and mediated across these technological developments.

Through iterative comparison of studies across publication periods, four analytically distinct yet overlapping phases were identified: (1) Pre-digital empathy (≤1999), characterized by embodied, face-to-face relational care; (2) Early Digital Phase (2000–2010), marked by the emergence of Internet-based communication, telemedicine, and early telehealth technologies; (3) Digital Expansion Phase (2011–2017), reflecting the rapid growth of telehealth, mobile health applications, and digitally mediated care; and (4) AI-mediated Phase (2018–Present), characterized by the integration of artificial intelligence, conversational agents, machine learning, and algorithm-driven communication systems into healthcare interactions. The year 2018 was selected because it marks the emergence of influential literature on AI-assisted healthcare communication, conversational agents, and digital mental health technologies, representing a distinct conceptual transition in the evolution of digital empathy.

These temporal boundaries were therefore not imposed arbitrarily but derived through alignment between technological milestones and recurring conceptual patterns identified within the reviewed literature. The segmentation served as an analytical structure for examining how empathic engagement was reconfigured across evolving socio-technological conditions while recognizing that transitions between phases remained gradual and overlapping rather than strictly linear.

Phase 3: Concept Comparison Across Eras. In this phase, definitions and descriptions of empathy were examined within each temporal segment. The analysis focused on identifying core attributes, contextual conditions, and mechanisms of expression associated with empathy in each era. Comparative analysis was conducted to determine how these elements differed or persisted across periods, highlighting both continuity and transformation.

Phase 4: Evolution Tracing. The fourth phase involved tracing the evolutionary trajectory of digital empathy by identifying key shifts and transitions across temporal phases. Particular attention was given to the progression from human-centered empathy to mediated, hybrid, and AI-assisted forms. Turning points were identified based on significant technological or contextual changes, such as the rise of telehealth or the integration of AI in healthcare communication. This phase elucidated how empathy has been reconfigured in response to evolving modes of interaction.

Phase 5: Trajectory Synthesis. The final phase synthesized the findings into a conceptual trajectory model, representing the progression and transformation of digital empathy over time. This model integrates insights from all preceding phases, illustrating how empathy evolves across relational, technological, and epistemic dimensions. The synthesis provides a dynamic conceptualization of digital empathy, emphasizing its adaptive and context-dependent nature.

4. Methodological Rigor

Methodological rigor was strengthened through structured temporal organization, iterative conceptual comparison, and cross-era interpretive triangulation consistent with TECA. Temporal validity was operationalized by grouping studies into analytically derived historical phases based on major developments in healthcare communication and digital technology. Each study was reviewed within its respective temporal context to ensure that conceptual interpretations reflected the technological and relational conditions of that period rather than contemporary assumptions.

Conceptual consistency was maintained through repeated comparative analysis of definitions, attributes, and relational mechanisms across temporal phases. During analysis, extracted concepts related to empathic presence, communication, responsiveness, embodiment, and human–technology interaction were continuously compared across studies and historical periods to identify patterns of continuity, transition, and conceptual transformation.

Cross-era triangulation was operationalized by integrating evidence from multiple disciplinary perspectives, including nursing, telehealth, communication studies, and human–computer interaction, within each temporal phase. Interpretations were refined through iterative comparison of theoretical, conceptual, and empirical literature to reduce dependence on isolated disciplinary viewpoints and strengthen the coherence of the emerging conceptual trajectory.

In addition, analytic decisions, temporal classifications, and inclusion rationales were documented throughout the interpretive process to support transparency and methodological traceability within the conceptual synthesis.

RESULTS

1. Definition of Digital Empathy

Through TECA, *digital empathy is defined as a dynamic, context-dependent mode of technologically mediated relational engagement characterized by the capacity to perceive, interpret, and respond to emotional and experiential cues through digital interfaces, enabling shared understanding in virtual and hybrid environments.* This definition departs from static or purely interpersonal interpretations of empathy by emphasizing its adaptive, processual, and technologically situated nature. Digital empathy is not merely the extension of traditional empathy into digital settings but represents a reconfiguration of empathic processes, shaped by changing modalities of interaction, presence, and communication.

2. Temporal Phases of Digital Empathy

The analysis identified four distinct yet interconnected temporal phases, each reflecting shifts in how empathy is conceptualized and enacted within evolving technological landscapes.

The first phase, human-centered empathy, is primarily characterized by face-to-face relational care, where empathic engagement is strongly associated with physical co-presence, embodied interaction, and direct sensory communication. In much of the foundational caring science and clinical communication literature, empathy is described as a relational process grounded in verbal and nonverbal cues, such as facial expressions, touch, tone, and immediate interpersonal responsiveness. However, this phase should not be understood as entirely unmediated; earlier forms of indirect, written, institutional, and technology-assisted communication also influenced relational care practices. Rather, the defining feature of this period is the predominance of physically situated interaction as the central condition through which empathy was conceptualized and enacted within healthcare relationships.

The second phase, mediated empathy, emerges with the introduction of early digital communication technologies, including email, telephone consultations, and initial telehealth systems. In this phase, empathy begins to be translated into technologically mediated forms, requiring adaptation to reduced sensory input and delayed or asynchronous communication. Empathic engagement becomes dependent on textual expression, vocal tone, and interpretive inference, marking a shift from direct perception to mediated understanding.

The third phase, hybrid empathy, reflects the expansion of digital platforms and the integration of synchronous communication technologies, such as video consultations, mobile health applications, and interactive online environments. Here, empathy is enacted within blended relational spaces that combine elements of physical and digital presence. Visual and auditory cues are partially restored, enabling more nuanced interaction, yet remain constrained by technological interfaces. This phase is characterized by the emergence of mediated co-presence, where relational engagement occurs simultaneously across physical and virtual dimensions.

The fourth phase, algorithmic or AI-mediated empathy, represents the most recent development, characterized by the incorporation of artificial intelligence, machine learning, and affective computing into healthcare and communication systems. In this phase, empathy is not only expressed by human actors but also simulated or augmented by technological systems, such as chatbots and emotion-recognition algorithms. Empathy may increasingly become partially delegated to, simulated by, or relationally co-constructed through machine-assisted systems, whereby AI supports specific empathic functions, such as recognizing emotional cues and generating contextually appropriate responses, without replacing the human relational and moral dimensions of empathy. This development raises important philosophical and ethical questions

regarding authenticity, agency, emotional interpretation, and the nature of relational engagement within technologically mediated environments.

3. Shifting Attributes

Across these temporal phases, the analysis revealed substantial transformations in the core attributes of empathy, reflecting its adaptation to changing communicative conditions.

One interpretive pattern identified across the reviewed literature is the gradual transition from physical presence toward forms of mediated presence within technologically supported healthcare interaction. In foundational caring and clinical communication literature, empathic presence is predominantly associated with physical co-location, embodied interaction, and direct sensory engagement. Across later digital health literature, however, relational connection is increasingly conceptualized as technologically facilitated, wherein engagement may be sustained despite spatial separation through telecommunication and virtual interaction platforms. Within this interpretive synthesis, mediated presence refers to the reconstruction of relational immediacy through digital interfaces that attempt to support communication, responsiveness, and interpersonal connection in the absence of shared physical space.

A second transformation involves the shift from emotional attunement to digital responsiveness. While traditional empathy emphasizes the intuitive and affective attunement to another's emotional state, digital contexts require the development of interpretive and communicative competencies that enable the recognition and expression of empathy through limited or altered cues. Emotional understanding becomes increasingly dependent on symbolic, textual, or algorithmic representations of affect.

A third shift concerns the movement from embodiment to virtual embodiment. In face-to-face interactions, empathy is deeply embodied, involving sensory perception and physical presence. In digital environments, embodiment is reconstructed through virtual representations, such as video, avatars, or textual expression. This virtual embodiment alters the way empathic connection is experienced and expressed, introducing both new possibilities and limitations.

4. Drivers of Evolution

The evolution of digital empathy is shaped by multiple interrelated drivers that influence both the context and the necessity of its development.

One interpretive pattern emerging from the reviewed literature is the role of technological advancement in reshaping empathic engagement within healthcare and communication contexts. Studies on telemedicine, relational agents, digital communication, and AI-assisted interaction suggest that the progression from basic telecommunication systems to sophisticated artificial intelligence platforms has expanded opportunities for mediated relational interaction while simultaneously introducing concerns regarding authenticity, interpretation, and ethical responsibility (Bickmore & Picard, 2005; Inkster et al., 2018; Mair & Whitten, 2000; Topol, 2019).

A second recurring driver identified across the corpus is the increasing healthcare demand for accessible, efficient, and scalable care delivery. Literature on telehealth and virtual care consistently highlights how remote and technology-enabled healthcare environments require adaptive forms of empathic communication capable of sustaining relational connection despite physical separation (Kruse et al., 2017; Shachar et al., 2020; Shore et al., 2018).

Additionally, several contemporary studies associate the accelerated expansion of digitally mediated empathy with global disruptions, particularly the COVID-19 pandemic, which intensified reliance on virtual communication and remote care infrastructures (Booth et al., 2021; Budd et al., 2020). Within this interpretive synthesis, these developments collectively appear to contribute to the evolving conceptualization of empathy across technologically mediated healthcare environments.

5. Conceptual Trajectory Model

The synthesis of findings led to the development of a conceptual trajectory model illustrating the evolution of digital empathy as a progressive, multidimensional process. This trajectory can be represented as: *Human-centered → Mediated → Hybrid → AI-mediated empathy*.

This proposed trajectory model reflects patterns of both continuity and transformation identified through the interpretive synthesis of the reviewed literature. While the central relational intention commonly associated with empathy—understanding and responding to others—appears to persist across temporal phases, its forms, mechanisms, and expressions are understood to evolve in response to changing technological and contextual conditions. The trajectory should not be understood as strictly linear or universally applicable; rather, the phases are conceptualized as layered and overlapping, with earlier forms of empathic engagement continuing to coexist alongside emerging technologically mediated forms.

Within this interpretive framework, digital empathy is provisionally conceptualized as an adaptive and evolving socio-technological construct shaped by the dynamic interplay of relational, technological, and societal forces. The model does not claim definitive empirical validation, but instead offers a heuristic conceptualization intended to support theoretical reflection and future empirical inquiry. From this perspective, empathy may be reconsidered not as a fixed attribute, but as a context-sensitive and processual phenomenon that is continuously reconfigured within emerging landscapes of care and technologically mediated communication. Rather than functioning solely as an

extension of traditional empathic practice, digital empathy may also represent a qualitative transformation in the conditions through which relational presence, emotional attunement, and embodied understanding are enacted across digital and hybrid interactional environments.

This reconceptualization positions digital empathy as a fluid and evolving phenomenon interpreted across temporal phases and communicative modalities. As illustrated in Figure 2, the proposed framework synthesizes antecedent conditions, core relational attributes, transformation mechanisms, and outcome domains into a multidimensional conceptual model. Collectively, these elements provide a provisional theoretical structure for understanding digital empathy as a socio-technological construct grounded in caring science while remaining responsive to the expanding role of artificial intelligence and technologically mediated interaction within contemporary healthcare environments.

The included corpus was not intended to serve as an exhaustive bibliometric inventory of all literature on digital empathy. Rather, studies were purposively selected for their conceptual relevance to the temporal evolution of empathic engagement in technologically mediated healthcare and communication contexts. Inclusion prioritized works that contributed substantively to shifts in relational conceptualization, mediated interaction, empathic communication, or human–technology engagement across identified historical phases. Seminal and theoretically influential studies were retained even when adjacent literature existed, as the primary objective of TECA was interpretive conceptual synthesis rather than comprehensive coverage of systematic literature. Accordingly, the corpus should be understood as an analytically constructed interpretive sample designed to support trajectory development and conceptual comparison across temporal phases.

To facilitate interpretation of the analytical process, Figure 1 presents the TECA framework used in this study. The figure illustrates methodological architecture guiding the historical and interpretive synthesis of digital empathy across technological eras. Specifically, it outlines the sequential relationship between corpus construction, temporal segmentation, cross-temporal conceptual analysis, and evolutionary trajectory mapping. The framework demonstrates how literature from different historical periods was comparatively analyzed to identify recurring relational patterns, conceptual shifts, and emerging forms of empathic engagement. In this study, Figure 1 should therefore be interpreted primarily as a methodological and analytical map showing how the trajectory synthesis was constructed through TECA rather than as a definitive model of digital empathy itself.

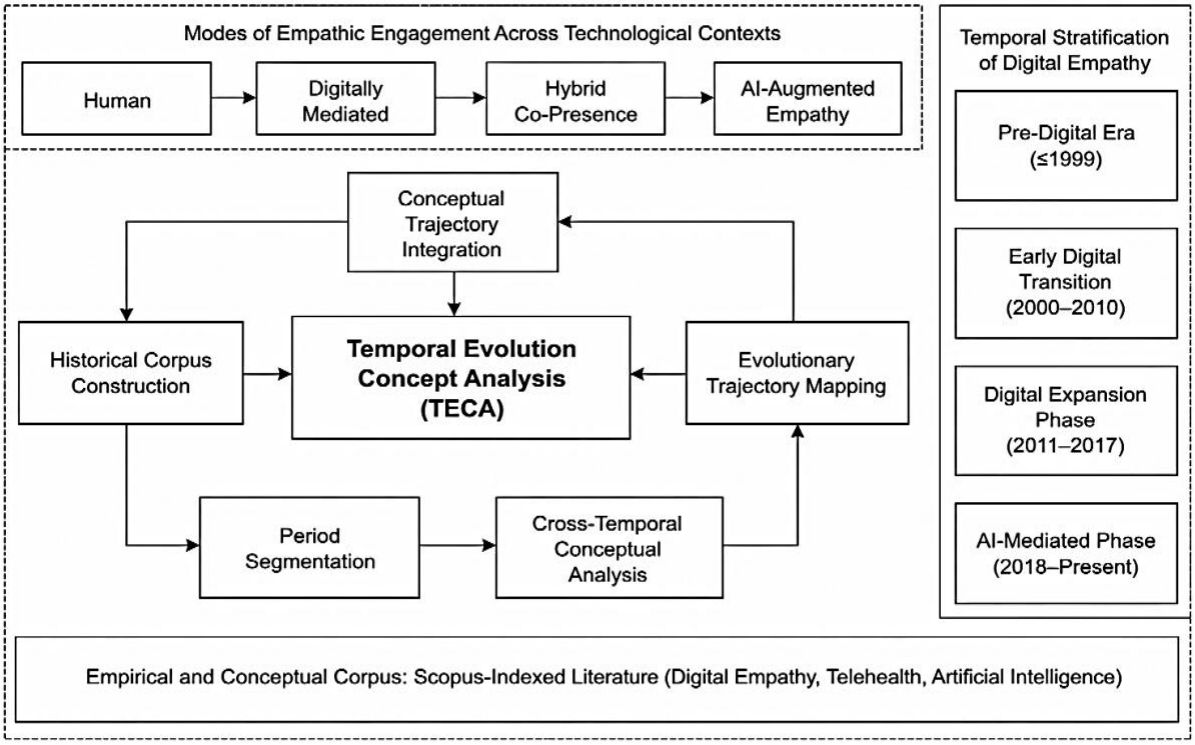

Figure 1. Temporal Evolution Concept Analysis (TECA) Framework for the Conceptualization of Digital Empathy

Building on the analytical process illustrated in Figure 1, Figure 2 presents the resulting conceptual model of digital empathy derived from interpretive synthesis. Whereas Figure 1 explains how the analysis was conducted, Figure 2 illustrates the conceptual relationships that emerged from it. The model synthesizes antecedent conditions, relational attributes, transformation mechanisms, and outcome domains associated with digital empathy across

temporal phases of technological evolution. It conceptualizes digital empathy as a multidimensional and evolving socio-technological phenomenon shaped by interactional modality, technological mediation, relational intentionality, and communicative adaptation. Readers should interpret Figure 2 as a provisional heuristic framework intended to organize and theoretically integrate patterns identified across the reviewed literature rather than as a finalized or empirically validated model. Together, Figures 1 and 2 provide complementary representations of the study's methodological process and conceptual synthesis.

To enhance methodological transparency, Table 1 summarizes the TECA process used to identify, screen, evaluate, and temporally classify the literature included in this study. The matrix presents the sequential stages of corpus development that informed the interpretive synthesis and trajectory analysis of digital empathy within the TECA framework.

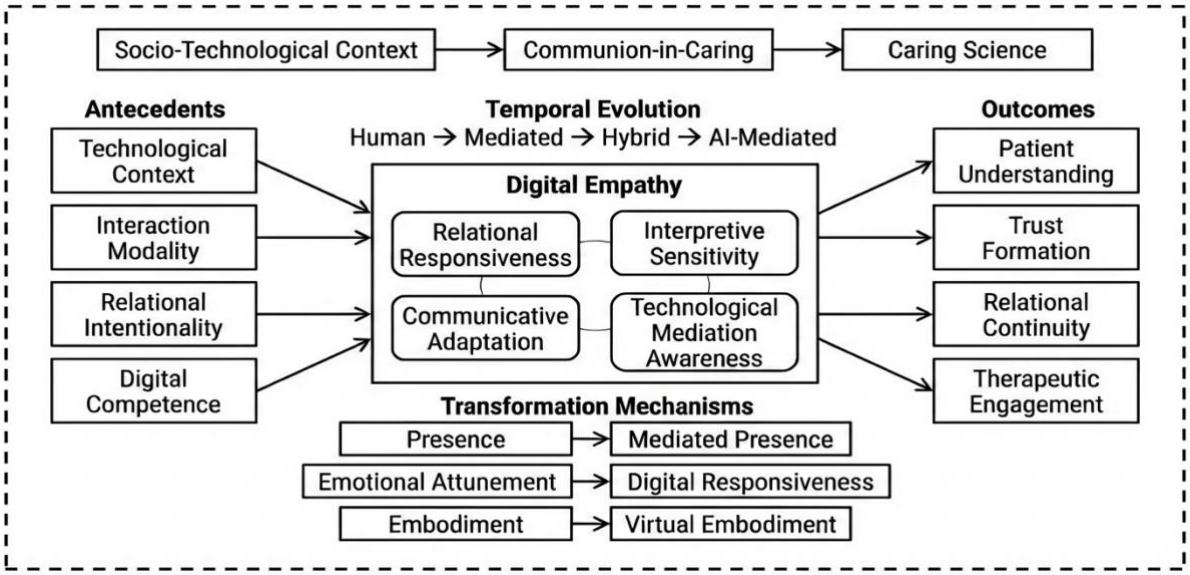

Figure 2. Conceptual Model of Digital Empathy Derived from Temporal Evolution Concept Analysis (TECA)

Following corpus selection, the included studies were organized into four temporal phases based on their predominant conceptual and technological characteristics. Table 2 summarizes this temporal classification, presenting the defining features, number of included studies, and analytical contribution of each phase.

Table 3 presents the individual studies included in the TECA analysis, together with their temporal classification and respective conceptual contributions to the evolution of digital empathy.

DISCUSSION

The findings of this interpretive concept analysis suggest that empathy may be more appropriately understood not as a static or universally fixed construct, but as a dynamically evolving phenomenon shaped by changing socio-technological conditions. Across the reviewed literature, empathy is consistently associated with relational engagement, presence, attunement, and responsiveness; however, the ways in which these processes are conceptualized and enacted appear to shift across technologically mediated healthcare environments. Foundational caring science and clinical communication literature predominantly conceptualize empathy as an embodied and relational process grounded in face-to-face interaction, where presence, attunement, and mutual responsiveness are co-constructed through direct sensory engagement (Halldórsdóttir & Hamrin, 1997; Morse et al., 1991; Suchman et al., 1997). Within this interpretive synthesis, these patterns suggest that traditional conceptualizations of empathy were strongly associated with physical co-presence and immediate interpersonal interaction.

At the same time, the reviewed literature further indicates that the integration of digital technologies into healthcare has altered the communicative and relational conditions through which empathic engagement occurs. Rather than demonstrating the disappearance of empathy, the corpus suggests a gradual reconfiguration of empathic processes across mediated, hybrid, and increasingly AI-assisted forms of interaction. The discussion that follows, therefore, interprets these developments as conceptual transformations emerging from the reviewed literature rather than as definitive empirical conclusions regarding the nature of empathy itself.

Across the temporal phases identified through TECA, empathy transitions from direct relational presence to technologically mediated interaction, and ultimately toward hybrid and AI-assisted configurations. Early telemedicine literature highlights how the absence of physical proximity necessitates adaptive communicative strategies to preserve relational quality (Collins et al., 2000; Mair & Whitten,

2000). Rather than diminishing empathy, these constraints stimulate its transformation into forms that rely on linguistic precision, intentional responsiveness, and interpretive inference.

As digital health systems expand, empathy is enacted through mediated co-presence, sustaining relational engagement across virtual platforms. Evidence indicates that patient satisfaction and trust can be maintained in telehealth environments when communication is intentionally structured and relationally attuned (Kruse et al., 2017; Nambisan, 2011; Shore et al., 2018). This phase reflects a shift from intuitive emotional attunement to digital responsiveness, in which empathy is conveyed through symbolic, textual, and audiovisual cues. The emergence of hybrid care further illustrates that empathy is no longer confined to a singular relational space but operates across integrated physical–digital environments.

In the most recent phase, empathy becomes increasingly shaped by artificial intelligence and algorithmic mediation. Technologies such as conversational agents and digital mental health systems have increasingly been designed to simulate or approximate empathic forms of communication within healthcare interaction (Bickmore & Picard, 2005; Inkster et al., 2018; Topol, 2019).

Some contemporary studies suggest that AI-generated responses may, under specific conditions, be perceived by users as emotionally responsive or relationally supportive, and in certain contexts may contribute to perceived communication satisfaction (Ayers et al., 2023). However, such responsiveness should not be interpreted as equivalent to human empathy in a relational, moral, or phenomenological sense.

Rather, the reviewed literature raises important distinctions between the simulation of empathic communication, the perception of empathy by users, and the embodied relational processes traditionally associated with authentic empathic engagement. Within this interpretive synthesis, the increasing role of AI in healthcare communication may therefore be understood as reconfiguring how empathy is represented, mediated, and experienced, while simultaneously introducing significant ethical questions regarding authenticity, agency, relational responsibility, and the boundaries of human–technology interaction (Ayers et al., 2023; Booth et al., 2021; Budd et al., 2020). This shift repositions empathy as a co-constructed phenomenon emerging within human–technology interaction. However, it also introduces ethical tensions related to authenticity, agency, and the boundaries of relational care (Booth et al., 2021; Budd et al., 2020).

Importantly, this transformation does not signify the erosion of empathy but its reconfiguration within new relational architectures. Empathy becomes a context-dependent process shaped by technological affordances and constraints, requiring competencies in digital communication, interpretive reasoning, and ethical discernment.

The movement from embodiment to virtual embodiment further illustrates how relational presence is reconstructed through digital interfaces, enabling connection despite physical absence.

Theoretical Contribution

This study may contribute to caring science and digital health scholarship by offering an interpretive reconceptualization of empathy as a temporally evolving and socio-technologically situated phenomenon. Through the application of a temporal lens, patterns identified across the reviewed literature suggest that empathy is frequently conceptualized not as a universally fixed trait or stable interpersonal skill, but as a relational process whose forms and expressions appear to shift across changing technological and communicative environments. Rather than positioning this interpretation as a definitive theoretical claim, the analysis proposes a provisional framework through which empathy may be understood as adaptive, context-sensitive, and historically situated within evolving modes of healthcare interaction.

The temporal phases identified in the analysis—human-centered, mediated, hybrid, and AI-mediated empathy—further suggest patterns of both continuity and transformation across technological eras. While relational responsiveness remains a recurring concern throughout literature, the mechanisms through which empathy is communicated, interpreted, and experienced appear to evolve alongside developments in telecommunication, virtual care, and artificial intelligence. Within this interpretive synthesis, the study therefore offers a heuristic conceptual contribution intended to support further theoretical refinement, interdisciplinary dialogue, and future empirical investigation into empathy within technologically mediated healthcare environments.

The identification of four temporal phases—human-centered, mediated, hybrid, and AI-mediated empathy—provides a structured framework for understanding both continuity and transformation. While the core intention of empathy remains consistent, its mechanisms and expressions evolve across technological contexts. This aligns with broader theoretical perspectives emphasizing the co-evolution of human practices and technological systems (Topol, 2019).

Furthermore, this study bridges disciplinary divides by integrating insights from nursing, communication, and human–computer interaction. It offers a unifying conceptual framework that accommodates diverse interpretations of empathy while maintaining coherence. From the perspective of the Theory of Communion-in-Caring, empathy is reaffirmed as a relational process of being-with, now extended into technologically mediated forms of presence (Tuppal et al., 2021; Tuppal et al., 2025).

Table 1. TECA Matrix for Identification, Screening, and Temporal Classification of Studies on Digital Empathy (*N* = 30)

Phase	Process Description	Criteria Applied	Records (*n*)	Outcome
Identification	Database search (Scopus, ScienceDirect, CINAHL) using keywords: digital empathy, tele-empathy, virtual care, online empathy, AI empathy, empathy in telehealth	Broad search; no date restriction; English language	1,845	Initial records identified
	Additional records from reference lists and manual search	Snowballing of key studies	75	Supplementary records
	Total identified	—	1,920	—
Screening	Duplicate removal	Automated + manual deduplication	420 removed	1,500 remaining
	Title and abstract screening	Relevance to empathy AND digital/technological context	1,240 excluded	260 retained
Eligibility	Full-text review	Peer-reviewed; conceptual, theoretical, or empirical focus on empathy in digital contexts; healthcare relevance	260 assessed	—
	Exclusion: not empathy-focused	No explicit/implicit empathy construct	80 excluded	—
	Exclusion: purely technical/engineering	No relational/caring dimension	55 excluded	—
	Exclusion: no conceptual contribution	Descriptive or tool-focused only	60 excluded	—
	Exclusion: non-healthcare context	Outside caring/health domains	25 excluded	—
	Exclusion: not accessible online / incomplete data	No full-text access or insufficient data	10 excluded	—
Inclusion	Final studies included in TECA analysis	Met all inclusion criteria	30	Final analytical corpus

Table 2. TECA Temporal Classification of Included Studies (*N* = 30)

Temporal Phase	Timeframe	Defining Characteristics	Included Studies (*n*)	Analytical Contribution
Pre-digital Empathy	≤1999	Face-to-face, embodied, relational empathy; direct presence and attunement	5	Establishes foundational conceptualizations of empathy as interpersonal and embodied
Early Digital Phase	2000–2010	Emergence of telecommunication; email, telephone, and early telehealth systems	10	Introduces mediated communication and early transformations in empathic interaction
Digital Expansion Phase	2011–2017	Growth of telehealth, mobile health, and online platforms; emergence of hybrid interaction environments	4	Demonstrates expansion of digital empathy and development of mediated co-presence
AI-Mediated Phase	2018–Present	Integration of artificial intelligence, machine learning, chatbots, and algorithmically mediated communication	11	Suggests emerging transformations toward hybrid and machine-assisted empathic engagement
Total	—	—	30	Supports interpretive temporal synthesis and conceptual trajectory development

Table 3. Matrix of Scopus-Indexed Studies Included in the Temporal Evolution Concept Analysis (TECA) of Digital Empathy (*N* = 30)

Temporal Phase	Author(s), Year	Context/Contribution to Digital Empathy	TECA Phase
Pre-Digital Empathy (≤1999)	Morse et al. (1991)	Foundational caring constructs: relational empathy	Pre-digital
	Morse, Anderson, et al. (1992)	Theoretical comparison of caring constructs	Pre-digital
	Morse, Bottorff, et al. (1992)	Clarification of empathy as a nursing concept	Pre-digital
	Halldórsdóttir and Hamrin (1997)	Caring and uncaring encounters; relational trust	Pre-digital
	Suchman et al. (1997)	Empathic communication in clinical encounters	Pre-digital
Early Digital Phase (2000–2010)	Reynolds et al. (2000)	Empathy measurement and application in nursing	Early digital
	Alligood and May (2000)	Personal systems and empathic engagement	Early digital
	Whitten et al. (2010)	Organizational conditions supporting successful and sustainable telemedicine programs	Early digital
	Mair and Whitten (2000)	Telehealth communication and satisfaction	Early digital
	Collins et al. (2000)	Patient satisfaction in telemedicine	Early digital
	Gerber and Eiser (2001)	Internet and patient–physician relationships	Early digital
	Miller (2001)	Doctor–patient interaction via telemedicine	Early digital
	Bickmore and Picard (2005)	Relational agents and digital empathy	Early digital
	Whitten and Love (2005)	Telemedicine satisfaction and communication	Early digital
	Agha et al. (2009)	Communication differences in teleconsultations	Early digital
Digital Expansion Phase (2011–2017)	Nambisan (2011)	Information seeking and perceived social support in online health communities as determinants of patients' perceived empathy	Expansion
	Hubley et al. (2016)	Telepsychiatry and relational care	Expansion
	Tan and Goonawardene (2017)	Internet health information and relationships	Expansion
	Kruse et al. (2017)	Telehealth satisfaction and communication	Expansion
AI-Mediated Phase (2018–Present)	Shore et al. (2018)	Empathy in telemental health	AI-mediated
	Morris et al. (2018)	Design and user evaluation of an artificially empathic conversational agent for mental health support	AI-mediated
	Inkster et al. (2018)	Empathy in mental health chatbot systems	AI-mediated
	Topol (2019)	Human and artificial intelligence in healthcare	AI-mediated
	van Lotringen et al. (2023)	Compassionate technology and empathy in blended and digital mental health interventions	AI-mediated
	Tudor Car et al. (2020)	Applications, design characteristics, and conceptual challenges of conversational agents in health care	AI-mediated
	Shachar et al. (2020)	Patient experience in virtual care	AI-mediated
	Budd et al. (2022)	Expression and preservation of empathy in patient–clinician telecommunication	AI-mediated
	Sakumoto and Krug (2021)	Digital empathy and remote therapeutic connection in telehealth encounters	AI-mediated
	Sakumoto and Joshi (2023)	Digital empathy in written and chat-based telehealth communication	AI-mediated
	Ayers et al. (2023)	Artificial intelligence versus physician empathy	AI-mediated

Comparison with Literature

The findings of this interpretive synthesis may extend portions of the existing literature by emphasizing the contextual and developmental dimensions of empathy across technologically mediated environments. Much of the foundational

literature conceptualizes empathy as a relational, interpersonal, moral, or communicative process grounded in therapeutic engagement and human responsiveness (Morse et al., 1991; Reynolds et al., 2000). However, these perspectives should not be understood as entirely static, as prior scholarship has also acknowledged the contextual and adaptive dimensions of empathic interaction across varying care environments. Contemporary literature on telehealth, digital communication, and AI-assisted interaction further expands these discussions by examining how empathy may be communicated, interpreted, or simulated within technologically mediated settings (Inkster et al., 2018; Kruse et al., 2017; Shore et al., 2018).

Within this broader body of scholarship, the present study does not seek to position traditional and contemporary perspectives as mutually opposing frameworks. Rather, the analysis interprets the literature as reflecting an ongoing conceptual transition in which earlier relational understandings of empathy continue to persist while newer technologically mediated forms emerge alongside them. From this perspective, the proposed trajectory model is intended not to replace prior conceptualizations, but to provide a historically oriented interpretive framework through which continuity, adaptation, and conceptual transformation across technological contexts may be more explicitly examined.

Methodological Contribution

This study may also offer a methodological contribution through the application of TECA as an interpretive framework for examining conceptual transformation across historical and technological contexts. Existing concept analysis approaches within nursing and health sciences have traditionally focused on identifying defining attributes, antecedents, and consequences of concepts within relatively static analytical frames. While these approaches remain valuable for clarifying conceptual structure, they may be less suited for examining concepts that evolve rapidly across changing socio-technological environments.

Within this context, TECA was developed in this study as a historically oriented and interpretive analytical approach intended to incorporate temporal segmentation, cross-era comparison, and trajectory synthesis into concept analysis. Rather than examining concepts as fixed entities, TECA emphasizes how conceptual meanings, relational conditions, and communicative expressions may shift across technological and historical periods. The framework was therefore applied to explore how digital empathy appears to evolve from predominantly embodied and face-to-face relational contexts toward increasingly mediated, hybrid, and AI-assisted forms of interaction.

The methodological value of TECA should be understood as provisional and exploratory rather than as a replacement for existing concept analysis methodologies. Instead, the framework is proposed as a complementary interpretive approach that may be useful for examining evolving constructs situated within rapidly changing technological, communicative, and healthcare environments. Further methodological refinement and empirical application across additional concepts and disciplinary contexts remain necessary to evaluate its broader analytical utility.

Implications for Practice, Education, and Research

The findings suggest that digital empathy competencies may involve more than general communication skills alone. Within technologically mediated healthcare environments, healthcare professionals may require competencies in relational responsiveness during teleconsultations, interpretation of limited verbal and nonverbal digital cues, maintenance of therapeutic presence despite physical separation, and ethical communication within AI-assisted or platform-mediated interactions. The proposed framework may therefore assist healthcare institutions in developing practice guidelines that emphasize empathic communication strategies appropriate for telehealth, virtual care, and digitally supported clinical interaction.

The proposed conceptual model may also provide a preliminary framework for curriculum development in nursing and health professional education. Digital empathy competencies could include training in mediated therapeutic communication, virtual patient engagement, digital professionalism, ethical awareness in AI-assisted interaction, and critical reflection regarding the differences between simulated responsiveness and authentic relational care. Simulation-based telehealth exercises, virtual consultation scenarios, and reflective communication training may further support the development of these competencies within contemporary healthcare education.

Future research may further examine and refine the proposed framework through empirical and interdisciplinary investigation. Mixed-methods, longitudinal, and practice-based studies may help evaluate how digital empathy is experienced across diverse healthcare contexts and technological platforms. Additional research may also explore how the framework could inform competency standards, telehealth communication protocols, digital care evaluation tools, and ethical guidelines for AI-mediated healthcare interaction.

Limitations

This study has several limitations. First, the study is conceptual and interpretive in nature, as TECA relies on secondary literature rather than direct empirical validation. Consequently, the proposed trajectory model should be understood as a heuristic and interpretive framework rather than a definitive or

universally generalizable representation of digital empathy.

Second, sampling bias may be present due to the prioritization of primarily Scopus-indexed and English-language literature, which may have excluded relevant perspectives from other linguistic, regional, or disciplinary contexts.

Third, the interpretive synthesis process may be influenced by author-level conceptual interpretation and analytical judgment, particularly in relation to temporal categorization, thematic abstraction, and trajectory synthesis. Although structured analytical procedures were employed, interpretive bias cannot be fully eliminated within concept-analytic inquiry.

Fourth, the temporal boundaries used for segmentation were analytically derived from recurring technological and conceptual patterns identified within the literature; however, these boundaries remain provisional and overlapping rather than objectively fixed historical divisions.

Fifth, the proposed conceptual framework did not undergo external expert validation or empirical testing, limiting the extent to which its analytical structure can presently be confirmed across broader healthcare contexts.

Finally, the rapid evolution of digital technologies, artificial intelligence systems, and healthcare communication environments may continue to reshape the meaning and practice of digital empathy beyond the phases identified in this study.

Accordingly, the framework should be interpreted as a contextually situated and evolving conceptual model that may require further refinement through future theoretical and empirical investigation.

Because this study is conceptual in nature, the implications presented here should be regarded as provisional. Future empirical studies are warranted to validate and refine the proposed framework and its applicability across diverse healthcare and digital care environments.

CONCLUSION

This study proposes digital empathy as an adaptive and evolving socio-technological construct shaped by changing modes of healthcare interaction and technological mediation. Through TECA, the reviewed literature was interpreted as suggesting a gradual transition from predominantly embodied and face-to-face forms of empathic engagement toward increasingly mediated, hybrid, and AI-assisted relational environments. Within this interpretive synthesis, empathy appears not as a fixed or universally stable attribute, but as a context-sensitive relational process that may be continuously reconfigured across evolving communicative and technological conditions.

Rather than establishing a definitive model, the study advances a provisional conceptualization intended to support ongoing theoretical reflection, interdisciplinary dialogue, and future empirical inquiry regarding empathy within technologically mediated healthcare systems. The proposed framework offers a conceptual foundation for exploring how relational presence, communication, and empathic responsiveness may continue to evolve alongside emerging digital health technologies and artificial intelligence applications in contemporary care environments.

Author Contributions

The author was solely responsible for the conception and design of the study, data collection, analysis, interpretation of findings, and manuscript preparation. The author critically revised the manuscript for intellectual content and approved the final version for publication. The author agrees to be accountable for all aspects of the work and ensures that questions related to the accuracy or integrity of any part of the study are appropriately investigated and resolved.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Conflict of Interest

Cyruz P. Tuppal serves as a member of the International Editorial Board of the Celebes Nursing Journal. To ensure editorial independence and transparency, he was not involved in the editorial assessment, peer-review process, editorial decision-making, or final publication decision for this manuscript. Apart from this editorial role, the author declares no financial, personal, or professional conflicts of interest that could have influenced the research or its outcomes.

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Declaration of Use of AI in Scientific Writing

During the preparation of this manuscript, the author used AI-assisted technologies, specifically Grammarly and QuillBot, to improve grammar, spelling, punctuation, sentence structure, clarity, and overall readability.

All content was critically reviewed, verified, and revised by the author. The author takes full responsibility for the accuracy, integrity, originality, and scientific validity of the manuscript. The use of these AI-assisted technologies does not imply authorship, and neither Grammarly nor QuillBot is listed as an author of this work.

The author affirms that all research methods, analyses, interpretations, conclusions, and scholarly judgments presented in this manuscript are entirely their own and comply with the ethical standards and publication policies of the journal.

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