Design and Validation of a Competency Development Model for Digital Transformation Leadership in the Banking System

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Abstract

The present study aimed to design and validate a competency development model for digital transformation leadership in the country's banking system. This research follows an exploratory mixed-methods approach. The qualitative phase employed thematic analysis, while the quantitative phase utilized a survey research method. The statistical population in the qualitative section consisted of 15 banking system experts, selected through purposive sampling based on the principle of theoretical saturation. In the quantitative section, the statistical population included bank managers and supervisors across the country, from whom a sample of 335 individuals was selected using stratified random sampling. In the qualitative phase, data collection was conducted through field research using semi-structured in-depth interviews. Similarly, in the quantitative phase, data collection was also based on field research, utilizing a researcher-developed questionnaire. Data analysis in the qualitative phase was performed using coding techniques, while in the quantitative phase, descriptive and inferential statistical methods were employed. The results indicated that digital leadership competencies include individual characteristics, digital intelligence, and digital capability/capacity. Additionally, competency development methods comprise self-learning, virtual training, experience transfer, coaching and consulting, role-playing, behavior analysis, job rotation, on-the-job training, workshops, mentoring, and career path planning. The findings also revealed that bank managers possess the necessary competencies and are in a favorable state.

Keywords: *Competency, Competency Development, Digital Transformation, Digital Transformation Leadership Competencies.*

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1. Introduction

In the digital age, the emergence of new technologies has fundamentally transformed traditional business beliefs. Organizations have only one viable path forward: to keep pace with ongoing changes. Otherwise, they will be eliminated from competition and ultimately vanish from the market [1]. In this context, the concept of "digital transformation" in general and "digital transformation leadership" in particular are relatively new topics in the business domain, which have received limited attention in academic research. Studies indicate that in the field of digital transformation leadership, the industry has outpaced academia, with commercial organizations showing greater interest in this concept [2].

In today's highly competitive and continuously evolving environment, leaders are constantly faced with new challenges, requiring them to align both their organizations and leadership styles with the dynamic landscape. The pivotal role of leaders in shaping organizational identity in the digital era, along with the necessity for strategic foresight and proactive movement, is more critical than ever [3]. Consequently, organizational scholars and theorists, in response to these vast technological changes, have introduced the concept of digital leadership, referring to leaders who execute many of their leadership processes through digital channels and media [4].

Across Industry 4.0, numerous studies have demonstrated how organizations can pursue digital transformation and innovate their processes to generate significant advantages. However, for organizations to remain successful and sustain their survival in today's disruptive market environment, they must address the challenges posed by digital transformation, innovation, commitment, emerging skill sets, and rapidly advancing technologies [5].

One of the dominant approaches in human resource management is the competency-based approach. Competency encompasses the knowledge, skills, and attitudes that individuals need to possess and enhance [6]. These key factors are essential for performing critical roles at a high or above-average level, such as leadership and management [7]. Leadership competencies include the knowledge, skills, and abilities that help managers enhance leadership effectiveness and improve individual, group, and organizational performance. These competencies enable managers to differentiate themselves from others and enhance their own capabilities [8].

One of the most significant challenges facing organizations and public and private institutions in the third millennium is the selection and appointment of competent and efficient managers. This challenge has become even more pronounced due to fundamental technological challenges and financial and economic crises in recent years. According to research by Müller and Turner (2010), in many large organizations, four out of every ten managers lack the necessary effectiveness, resulting in substantial losses for organizations [9]. Digital transformation has become a strategic imperative on leadership agendas [10]. However, there are limited conceptual and empirical studies examining how organizations undergo digital transformation. In today's turbulent business world, organizations are striving to identify, attract, and retain the most competent managers as a competitive advantage [11].

Among these developments, digital transformation and digital banking have become hot topics in the banking industry. A significant number of banks in the country, under the direction of the Ministry of Economic Affairs and Finance, are currently formulating roadmaps for their digital banking transformation. However, given the novelty of these concepts globally, and particularly in Iran, there is a concern that a lack of proper understanding may lead to wasted investments in this domain. Therefore, the national banking system must establish criteria for selecting, promoting, and empowering managers that foster the development of their digital transformation competencies. To select these individuals, clear and measurable criteria are required.

One of the primary challenges banks face in this regard is the absence of a model and, consequently, measurable criteria for selecting, employing, and promoting managers. Furthermore, statistics indicate that 96% of banking experts believe that emerging technologies utilized by technology-driven companies are handling the core functions of banks and significantly influencing the banking industry, while banks themselves utilize only 15% of available technologies (Saeed Panah et al., 2020). This may be attributed to the lack of appropriate models and criteria for assessing leadership competencies in digital transformation.

Accordingly, this study seeks to answer the following question: How can a model for developing and validating digital transformation leadership competencies in the national banking system be designed and validated?

2. Methodology

2.1. Study Design

This study is applied research in terms of its objective. Based on the type of data, it follows a sequential mixed-methods approach. From a paradigmatic perspective, it adopts a pragmatic or hybrid approach (interpretivism and positivism). In terms of nature (approach and design), it is initially exploratory and subsequently descriptive-analytical. Regarding the type of reasoning (logic of execution), it is a mixed-methods study (inductive-deductive) as it incorporates both inductive reasoning (in the qualitative phase, meta-synthesis and Delphi technique) and deductive reasoning (in the quantitative phase, survey and correlation analysis).

2.2. Population and Sampling (Size and Sampling Method)

A. Qualitative Phase

The statistical population in the first stage of the qualitative phase (meta-synthesis) includes all academic articles and scientific works in domestic and international databases, as well as relevant documents and regulations in this field. At this stage, 20 articles were selected using a non-random purposive sampling method based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guideline. The criteria for selecting articles in the meta-synthesis method included recency and relevance to the research topic, high scientific quality and credibility, inclusion in reputable domestic and international databases, appropriate methodology, and diversity in perspectives.

In the second stage (Delphi technique), the statistical population comprised all officials and managers, university faculty members, and researchers knowledgeable in the banking system. Considering that the minimum number of experts in a Delphi panel is typically between 10 and 18 (Linstone & Turoff, 2011), this study selected 15 experts using a non-random purposive sampling method. The criteria for selecting experts included holding at least a doctoral degree, having teaching experience in fields related to the research area, possessing specialized expertise, participating in practical projects and relevant research, understanding policies, procedures, challenges, and barriers in the banking system, providing analytical insights, demonstrating a wide range of perspectives, commitment to participation, holding a managerial position, engaging in decision-making processes, and having practical experience relevant to the research domain.

B. Quantitative Phase

In this phase, the statistical population included all managers and supervisors of banks across the country. Given that prominent theorists such as Kline (2015) recommend a minimum sample size of 200 as a general rule for structural equation modeling (SEM) and confirmatory factor analysis (CFA), this study employed confirmatory factor analysis and aimed to enhance generalizability by selecting a sample size of 335 respondents using a stratified random sampling method.

2.3. Data Collection Tools, Validity, and Reliability

A. Qualitative Phase

In the first stage of the qualitative phase (meta-synthesis), data were collected through a systematic review of literature and credible scientific sources. This process involved a thorough and targeted search in scientific databases, articles, books, and dissertations related to the research topic. Content validity analysis in the meta-synthesis stage confirmed that the examined content and concepts were comprehensively covered in the existing literature. To ensure high accuracy, articles were carefully selected and screened. A flowchart (documenting the search and selection process) was used to identify relevant articles.

During this stage, constraints related to time (domestic and international coverage), location (domestic and international databases), research nature (synthesis, review, qualitative, and quantitative), and subject matter (keywords for searching) were established, followed by both broad and detailed screening processes. Internal validity results confirmed that findings from the meta-synthesis were not influenced by external factors and were accurately interpreted. Additionally, a 27-item checklist based on the PRISMA model, independent analysis by the researcher and a statistical expert, Cohen's Kappa coefficient for agreement, standard criteria application, repeatability (transparency in methodological execution), MAXQDA software for precise tracking of analysis and coding stages, and expert review for detecting contradictions were utilized.

To ensure reliability in the meta-synthesis method, techniques such as detailed documentation of the research process, intra-researcher alignment, and inter-researcher alignment were employed. Ultimately, the findings indicated that the meta-synthesis data were valid and reliable.

In the second stage of the qualitative phase (Delphi technique), a Delphi worksheet was used. Experts were asked not only to score the indicators but also to provide any

suggestions or add any additional indicators they deemed important. To ensure the validity of the Delphi worksheet, the questions were carefully designed to be simple, clear, and relevant. A straightforward and conceptual language was used to make the closed-ended questionnaire items easily understandable for experts. Before implementing the Delphi worksheet, content validity was assessed using the content validity ratio (CVR) formula, confirming the comprehensiveness and accuracy of the worksheet in covering the intended concepts.

Furthermore, the reliability of the Delphi worksheet was assessed using internal and temporal reliability measures, both of which indicated that the worksheet was valid and reliable.

B. Quantitative Phase

In the quantitative phase, data collection was conducted using researcher-developed questionnaires designed to assess both the internal validity (based on qualitative phase-identified indicators) and external validity (based on the final model).

The questionnaire development process for internal model validation followed these steps:

1. A systematic review of the literature in domestic and international databases was conducted to identify the competency development model for digital transformation leadership. This review was based on the PRISMA protocol as a standardized approach.
2. Identified articles were screened using predefined criteria, resulting in a final selection of 20 articles. These articles were analyzed using thematic analysis to identify assessment dimensions.
3. The identified factors were used as the basis for developing the Delphi worksheet items, and the final consensus among experts refined and localized these indicators across three Delphi rounds.
4. The questionnaire included items whose validity was confirmed through content validity analysis, and reliability was initially tested with a pilot group of 30 respondents, after which necessary modifications were made before distributing the final questionnaire to the target group.

The final questionnaire contained 42 items measured on a Likert scale ranging from "very high" to "very low" to assess the competency development model for digital transformation leadership in the national banking system.

To assess the questionnaire's validity, content validity was evaluated using Lawshe’s content validity ratio and content validity index, with input from ten experts. The content of the questionnaire was reviewed for redundant or unclear questions, and necessary revisions were made before distribution. Additionally, construct validity was assessed using both convergent and divergent validity with the help of SmartPLS 3 software, as detailed in the table below.

The reliability of the questionnaire was measured using Cronbach’s alpha coefficient, composite reliability, and McDonald’s omega coefficient. The obtained values for all questionnaire variables exceeded 0.70, confirming the reliability of the measurement tool.

Table 1. Questionnaire Information and Calculation of Validity and Reliability of the Instrument

Component	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Self-learning	0.789	0.745	0.399
Virtual Training	0.841	0.769	0.298
Experience Transfer	0.867	0.786	0.265
Coaching and Consulting	0.893	0.914	0.265
Role-playing	0.875	0.718	0.145
Behavior Analysis	0.867	0.863	0.246
Job Rotation	0.897	0.759	0.418
On-the-job Training	0.877	0.789	0.315
Workshops	0.916	0.824	0.314
Mentoring	0.896	0.867	0.365
Career Path Planning	0.754	0.839	0.418

Based on the above table, the reliability of the dimensions is confirmed as Cronbach's alpha and composite reliability coefficients exceed 0.7. Additionally, since AVE > 0.5, convergent validity is confirmed. The conditions CR > 0.7, CR > AVE, and AVE > 0.5 further validate convergent validity. Divergent validity is also confirmed, as MSV < AVE and ASV < AVE.

Apart from the aforementioned internal validity questionnaire, an adapted researcher-made questionnaire (based on Shoghi & Karimi, 2024) was also used to assess

model validity. This questionnaire consisted of two sections: external validity (24 items) and internal validity (10 items), totaling 34 items. The questionnaire was structured on a five-point Likert scale, ranging from "very low" to "very high." It was distributed both online and in person, and respondents were asked to provide their opinions on each item.

To ensure accuracy and precision in responses, theoretical and empirical supporting documentation of the model, along with the designed model and necessary explanations regarding the research objectives and questionnaire completion process, were provided to the experts. The validity of this questionnaire was assessed through content validity, and reliability was measured using Cronbach's alpha coefficient, confirming that the questionnaire was both valid and reliable.

Table 2. Distribution of Questionnaire Items for Model Validation

Dimension	Component	Cronbach's Alpha	Number of Items	Score Range	Number of Options	Likert Scale Options
External Validity	Research Objective	0.78	4	4-20	Five-point Likert scale	5 = Very High; 4 = High; 3 = Moderate; 2 = Low; 1 = Very Low
	Research Method Design		4	4-20		
	Control of Confounding Variables		8	8-40		
	Compliance		7	7-35		
Internal Validity	Logical Review	0.83	3	3-15		
	Expert Feedback		4	4-20		
	Sensitivity Analysis		3	3-15		

2.4. Data Analysis Method

A. Qualitative Phase

In the qualitative phase, thematic analysis was employed to identify the dimensions, components, and indicators of the digital transformation leadership competency development model in the banking system. This was conducted using MAXQDA Analytics Pro 2018 software.

Common themes and patterns were extracted from the selected research articles as well as from open-ended responses in the Delphi worksheets. In the Delphi stage, mean and standard deviation were used to evaluate results and determine the level of agreement among experts. Additionally, Kendall's coefficient of concordance was utilized to assess expert consensus regarding the prioritization of indicators in the closed-ended questionnaire, analyzed using IBM SPSS Statistics 16.

B. Quantitative Phase

In the quantitative phase, considering the research objectives, descriptive statistics were used to analyze demographic characteristics, including age, gender, education level, and work experience, through frequency percentages, tables, and charts. Additionally, research variables were described using mean, standard deviation, skewness, and kurtosis.

Inferential statistical methods were applied to validate the research model. Confirmatory factor analysis (CFA) was conducted to assess internal validity, ensuring that the identified factors adequately represented the underlying constructs. A one-sample t-test was used to evaluate external validity, determining whether the observed values significantly differed from a predefined standard.

All statistical analyses were performed using IBM SPSS Statistics 23 (2015) and SmartPLS v3 (2016) software.

3. Findings and Results

In the first stage of the qualitative phase, an in-depth meta-synthesis review was conducted to identify the dimensions, components, and indicators of the digital transformation leadership competency development model in the banking system. This stage employed a systematic review approach based on the PRISMA model, which allowed for a structured synthesis of relevant studies. The research scope was first determined, and relevant studies were selected based on predefined criteria, including publication date and research type. Selection parameters were established to ensure a comprehensive review, and search strategies were defined to retrieve documents from various academic databases. The selected documents then underwent a systematic evaluation process that included broad and detailed screening, followed by an in-depth critical analysis.

During the synthesis phase, two different types of synthesis were performed. The first type, aggregative synthesis, involved combining the findings of selected studies in a manner similar to meta-analysis in quantitative research, where results from various studies were compiled without altering their original context. This approach contrasted with integrative synthesis, which involved transforming the findings of previous studies into new data that were then merged and reinterpreted to create a new conceptual framework. These synthesis approaches helped refine the understanding of digital transformation leadership competencies and provided a foundation for developing a competency model.

A flowchart detailing the article selection process for digital transformation leadership competency development in the banking system was also created. This process involved applying constraints related to time (both domestic and international studies), location (specific databases), research nature (synthesis, review, qualitative, and quantitative studies), and subject matter (keywords used for searches). Broad and detailed screening processes were carried out to refine the selection, ultimately resulting in the identification of twenty high-quality articles. These selected articles were then assessed for quality using a structured 27-item checklist. The analysis of these articles revealed that between 2011 and 2024, only thirty studies had been published worldwide on the topic of digital transformation leadership competencies, with some employing a meta-synthesis approach and others not. The overall compliance rate of these articles with the quality checklist criteria was estimated at 64 percent, with the most significant deficiencies observed in the methodological sections of the studies, where quality gaps were estimated at 54 percent.

Further analysis revealed that many systematic review articles suffered from methodological errors, inconsistencies in synthesized results, and a failure to account for biases. The majority of relevant articles were published between 2017 and 2020 internationally (64.7 percent) and between 2017 and 2021 domestically (68.2 percent). Among these studies, 42.5 percent were authored by researchers in organizational management, while 33.1 percent came from legal scholars. Additionally, 33.3 percent of the articles were domestic, while 66.6 percent were international. The results of the 27-item checklist demonstrated that all reviewed articles exhibited either adequate or high quality, as the quality score for each item was either above 75 percent or between 50 and 75 percent. Any item scoring below 50 percent was considered low-quality. Inter-rater reliability was also assessed using Cohen's Kappa coefficient, which was found to be 0.57, indicating a moderate to strong level of agreement between independent evaluators.

The synthesis process was further refined through both aggregative and integrative approaches to identify the key dimensions of digital transformation leadership competency development in the banking system. These findings were then used to extract key indicators from the meta-synthesis process, which were subsequently represented visually through a word cloud of extracted concepts.

Following the completion of the meta-synthesis phase, the second stage of the qualitative phase employed the Delphi technique to validate and refine the identified indicators. In this stage, a Delphi worksheet was developed based on the findings from the meta-synthesis and distributed to a panel of experts. Experts were asked to rate each indicator on a scale from one to five, and any indicators that received an average score below four were eliminated. During the first round of the Delphi process, five indicators received scores below four and were removed from further consideration. The second round of Delphi was conducted without these eliminated indicators, during which six indicators were revised based on expert feedback. However, no additional indicators were removed, and the experts confirmed the proposed structure of components and dimensions.

To ensure the finalization of the model, the third round of Delphi was conducted. In this final round, all remaining indicators received scores above four, confirming their relevance and importance. To further validate the responses, Kendall's coefficient of concordance was calculated to assess the level of agreement among Delphi panel members. Findings indicated a strong consensus among experts in both the second and third Delphi rounds. As a result, the Delphi process was concluded after the third round. The findings from the third round of the Delphi technique are presented in the following table.

Table 3. Third Round of the Delphi Process for Designing and Validating the Digital Transformation Leadership Competency Development Model in the Banking System

Dimension	Component

Strategic Planning	Strategic Thinking
	Competitive Insight
	User-Centricity
	Digital Vision Formulation
	Cultural Insight
	Foresight
	Planning
	Monitoring and Control
	Change Orientation
	Goal Setting
Comprehensive Management	Behavior Management
	Collaboration and Team Building
	Digital Interaction with Customers
	Digital Customer Experience Management
	Motivation Creation
	Contingency Management
	Cost Management
	Resource Management
Knowledge Enhancement	Scientific Expertise
	Pedagogical Knowledge
	Environmental Awareness
	Networking
	Leadership in Organizational Learning and Innovation
	Business Knowledge
	Technical Knowledge
	Structural Awareness
	Digital Technology Comprehension
	Value Recognition
	Communication Knowledge
	Research Skills
	Interpersonal Skills
	Management Knowledge
Individual Traits	Ethical Values
	Inspirational Leadership
	Professional Skills
	People Guidance
	Intellectual and Ideological Agility
	Behavioral Traits
	Decisive and Pragmatic Leadership
	Ambitious Technical Objectives
	Freedom from Bureaucratic Procedures
	Organizational Independence
	Continuous Management and Evaluation
	Mental Agility
	Rapid Adaptability
	Fast Learning
	Digital Literacy
	Talented Managers and Flat Management Structure
	Flexibility
	Attitudinal Traits
	Personality Traits
Digital Resources	Digital Investment
	Digital Infrastructure
	Digital Talent
	Harmonization of Technical and Social Resources
	Digital Innovation
Intelligence	Technological Intelligence
	Emotional Intelligence
	Social Intelligence
	Development of Individual Competencies
	Development of Group Competencies

	Development of Organizational Competencies
	Development of Strategic Competencies
	Lifelong Learning
	Creativity
	Self-Development
	Flexibility
	Pragmatism
	Self-Leadership
	Organizational Leadership
	Leadership of Others

The one-sample t-test compares the observed mean scores against a predetermined benchmark value (typically reflecting a neutral or expected level of competency). As observed, all components yielded mean scores significantly above the benchmark, with t-values that are statistically significant ($p < .001$). These results support the external validity of the model by confirming that the competencies are perceived at a level significantly higher than the neutral point, indicating their relevance and effectiveness in the context of digital transformation leadership in the banking system.

Table 4. Third Round of the Delphi Process for Designing and Validating the Digital Transformation Leadership Competency Development Model in the Banking System

Component	Mean	Standard Deviation	t-value	p-value
Self-learning	4.12	0.65	5.23	< .001
Virtual Training	4.05	0.68	4.87	< .001
Experience Transfer	4.00	0.70	4.65	< .001
Coaching and Mentoring	4.18	0.62	5.45	< .001
Role-playing	3.95	0.66	4.20	< .001
Behavior Analysis	4.10	0.64	5.02	< .001
Job Rotation	4.00	0.67	4.68	< .001
On-the-job Training	4.08	0.63	5.10	< .001
Workshops	4.30	0.60	6.00	< .001
Mentoring	4.22	0.62	5.50	< .001
Career Path Planning	4.15	0.64	5.38	< .001

4. Discussion and Conclusion

The world is transitioning from an industry-centric society to an information-driven society, effectively moving from the physical world to the digital realm. Entering the information age and functioning effectively within an information-driven society necessitate an understanding of its defining characteristics. Every organization needs proactive and adaptable employees to achieve its objectives. When an organization commits to implementing dynamic training and human resource development systems, its workforce gains the flexibility to adapt to various organizational conditions. In other words, training and development serve as efficient tools for enhancing organizational members' competencies.

Successful digital transformation does not occur without extensive business efforts, a shift in mindset, process changes, the adoption of appropriate technologies, and skilled guidance from an experienced Chief Information Officer (CIO) or Chief Technology Officer (CTO). The CIO is a senior executive responsible for managing, implementing, and utilizing information and computing technologies. As technology continues to reshape industries globally, the role of the CIO has become increasingly significant. The CIO evaluates how various technologies can support business functions or improve existing processes and then integrates systems to achieve these improvements.

The findings of this study align with those of prior research [8, 12-15], all of whom highlighted simulation-based training as a key method for competency development. Based on the focus group discussions, each digital transformation leadership competency in the banking system can be developed through various training methods. Experts believe that technological personal traits can be enhanced through self-learning, experience transfer, and coaching and mentoring. Technological insights develop through virtual training, coaching and mentoring, job rotation, and workshops. Digital comprehension improves

through coaching and mentoring, role-playing, workshops, and career path planning. Understanding new business models can be advanced through self-learning, experience transfer, behavior analysis, job rotation, and workshops. Technological and digital skills are cultivated through self-learning, virtual training, on-the-job training, and workshops. Digital leadership can be strengthened through behavior analysis, mentoring, and career path planning. Communication skills develop through coaching and mentoring, role-playing, on-the-job training, and mentoring programs.

The findings suggest that workshops play the most significant role in developing digital leadership capabilities. Since workshops engage participants in hands-on learning experiences, they enable learners to acquire new skills in the shortest possible time. Additionally, workshops provide participants with networking opportunities and connections with industry professionals and business leaders. Coaching and mentoring also play a crucial role in competency development. Coaching involves guiding individuals toward their personal and professional goals, helping them realize their full potential. Coaches assist individuals by listening, asking questions, and challenging perspectives, ultimately aiding them in identifying next steps and making informed decisions. Coaches help individuals shape or refine their mindset and break down goals into actionable steps.

Mentoring, on the other hand, involves a senior or more experienced individual guiding a junior employee or trainee. A mentor invests time in understanding the mentee's challenges and provides support and constructive feedback. Mentors share their knowledge, skills, and experiences to facilitate the mentee's professional growth, often opening doors to new opportunities and career advancements. Self-learning is another essential educational approach for developing digital competencies. Unlike traditional learning, self-learning is neither confined to a specific location nor limited by time constraints. All that is required is access to a computer and a stable internet connection, making it a highly valuable method for individuals with time or location restrictions.

For digital leadership development, when leaders participate in workshops, they can further develop their digital competencies through self-learning methods. One of the primary limitations of this study is the inherent generalizability constraints of qualitative research and the questionnaire-based limitations in the quantitative phase. Additionally, since this study was conducted exclusively in Iran’s banking sector, applying its findings to other industries and organizations requires caution. Based on the study’s findings, future research should consider using the Fuzzy Delphi technique for indicator screening, as this technique not only filters indicators but also ranks them in order of importance. Furthermore, future studies are recommended to use a six-point Likert scale instead of the traditional five-point scale for better differentiation in responses.

Authors’ Contributions

Authors equally contributed to this article.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

All procedures performed in this study were under the ethical standards.

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