

A Prospective Study on the Development Trajectory of Clinical Empathy in Nursing Interns and Its Influencing Factors

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Abstract: Clinical empathy is crucial for building nursing professional competence, yet its developmental dynamics and mechanisms during the internship stage remain unclear. Existing cross-sectional studies struggle to reveal its evolution trajectory and heterogeneity. This study proposes a prospective longitudinal design aimed at systematically delineating the developmental pathways of clinical empathy in nursing interns and analyzing its multi-level influencing factors. By establishing a multi-center cohort and collecting data at multiple time points, the research will employ latent growth mixture modeling to identify differentiated subgroup development trajectories. Furthermore, it will integrate multi-level models to explain the predictive factors and mechanisms underlying trajectory differentiation from systematic perspectives, including individual cognitive-emotional regulation, clinical context interactions, and critical event reflection. This study is expected to move beyond static descriptions, providing an empirical foundation for understanding the dynamic formation process of this professional competence and for developing developmentally sensitive interventions.

Keywords: clinical empathy; developmental trajectory; nursing interns; prospective study; latent growth mixture modeling; influencing factors

Introduction

One of the core requirements of nursing practice is clinical empathy, which involves not only providing professional technical care but also deeply understanding and responding to patients' emotions and needs. The internship stage is a critical period for shaping this competency during the professional socialization of nursing. Although the importance of empathy is widely recognized, existing research has largely been confined to cross-sectional surveys or simple pre-post internship comparisons, failing to reveal the potential non-linear and heterogeneous dynamic trajectories of empathy development during the internship period. This knowledge gap limits our ability to predict the risks of stagnation or depletion in interns' empathy development and affects the effectiveness of targeted educational strategies. Therefore, adopting a prospective longitudinal study to systematically track the developmental pathways of empathy and conducting multi-level analyses that integrate individual traits and contextual factors hold significant theoretical and practical implications. This study aims to rigorously delineate the multiple dynamic trajectories of clinical empathy among nursing interns and to explore the underlying individual-context interaction mechanisms, thereby advancing the field from static associations to a deeper understanding of dynamic processes.

1. Theoretical Construct and Psychometric Foundations of Clinical Empathy

1.1 Conceptual Evolution and Core Dimensions of Empathy in the Nursing Field

The conceptualization of clinical empathy in the nursing field has evolved from a unidimensional affective focus to a multidimensional cognitive-affective integration. Early definitions often emphasized the affective component, equating it with the perception of and resonance with patients' emotional states. Contemporary theoretical frameworks, however, increasingly characterize it as a relational, process-oriented professional competence comprising three interrelated core dimensions: cognitive, affective, and behavioral. The cognitive dimension refers to the psychological process of understanding the patient's situation, perspective, and feelings. The affective dimension denotes the capacity to share and appropriately respond to the emotions experienced by the patient. The behavioral

dimension involves communicating understanding and care to the patient through verbal and caregiving actions. Within the context of nursing interns, its operational definition must clarify it as a dynamically developing professional psychological skill. Its core lies in maintaining a state of "engaged objectivity," which encompasses emotional connection while preserving professional boundaries and objective judgment. This conceptualization provides a clear theoretical target for tracking its developmental trajectory in this study.

1.2 Analysis of Empathy Assessment Tools Suitable for Tracking Developmental Trajectories

Prospective longitudinal studies impose specific requirements on the reliability, validity, sensitivity, and suitability for repeated measures of assessment tools. Regarding self-report scales, the Jefferson Scale of Empathy (Healthcare Professionals Version) is widely used due to its sound psychometric properties and emphasis on the cognitive component, making it suitable for detecting mean-level changes at the group level. However, self-report methods may be susceptible to social desirability bias. Behavioral measurement methods based on observation or standardized patient assessments can provide data with higher external validity but demand greater research resources. To capture the nuanced dynamics of developmental trajectories, research designs often necessitate a multi-method measurement strategy, which combines the use of stable self-report tools and contextualized behavioral assessments across multiple time points. The choice of tools directly impacts the ability to identify the shape of trajectories (such as linear growth, curvilinear change, or plateaus). Therefore, it is essential to evaluate their sensitivity in detecting subtle changes and to ensure measurement invariance across time points^[1].

1.3 Potential Theoretical Linkages Between Individual Psychological Traits and the Development of Clinical Empathy

Relatively stable individual psychological traits constitute the initial baseline for empathy development and serve as potential explanatory variables for differences in rates of change. Based on trait theory, personality dimensions such as empathic concern and perspective-taking tendency are considered significant factors influencing the entry-level competence of an individual's empathy upon entering clinical settings. From a cognitive neuroscience perspective, individual differences in mentalizing ability or cognitive empathy may modulate the efficiency with which an individual understands patients' intentions and emotions in complex clinical situations. Attachment theory provides another explanatory framework, proposing that an individual's internal working models influence their manner of establishing therapeutic interpersonal relationships, managing their own emotions, and maintaining professional boundaries, thereby potentially shaping the trajectory of empathy development. These traits are not deterministic; rather, they interact with experiences in the clinical learning environment. Theoretically, this interaction may predict differentiated developmental pathways among distinct groups of interns (e.g., high baseline-rapid growth, low baseline-slow growth), thus providing a theoretical foundation for subsequent analysis of heterogeneous trajectories.

2. Prospective Study Design and Trajectory Analysis Strategies

2.1 Construction of a Longitudinal Cohort and Multi-Timepoint Data Collection Plan

2.1.1 Cohort Definition and Dynamic Follow-up Management Strategy

The theoretical population of this study is defined as all nursing students entering a standard clinical internship cycle. In practice, an initial cohort will be constructed using a multicenter, cluster sampling strategy to encompass potential variations arising from different educational environments. During baseline enrollment, inclusion and exclusion criteria must be clearly defined—for instance, restricting participation to individuals embarking on their first full-time clinical internship who have completed identical foundational theoretical courses—to control for confounding factors in the initial state. To address the inevitable sample attrition in longitudinal research, a dynamic follow-up management protocol must be established in advance. This protocol should include standardized procedures for regular contact, low-burden mechanisms for participation feedback, and brief interviews with those who withdraw. The aim is to minimize attrition bias and to investigate whether attrition is systematically associated with certain characteristics related to empathy development.

2.1.2 Theoretically-Grounded Time Point and Measurement Wave Design

The temporal framework for data collection should not be arbitrary but must be theoretically designed based on developmental theories and the key stages of clinical training. The measurement waves need to cover potential sensitive periods or turning points in empathy development. A typical sequence may include: a pre-internship baseline assessment, following the initial adaptation period of the first clinical rotation, after experiencing significant clinical events, a comprehensive mid-internship assessment, and at the conclusion of the internship. This design allows for testing models such as the "stress-adaptation" model or the "experience accumulation" model. The multi-wave design provides a data foundation for distinguishing between short-term fluctuations and long-term trends and creates the conditions for applying more complex within-individual change analysis models^[2].

2.1.3 Multimodal Data Convergence and Measurement Invariance Testing

To overcome single-method bias, the data collection plan should adopt a multimodal data convergence strategy. The core self-report scale must remain strictly consistent across different measurement waves. Concurrently, contextualized measurements can be periodically embedded, such as coded evaluations of recorded interactions with standardized patients, or the use of the Experience Sampling Method to capture state empathy immediately following real-time clinical encounters. It is crucial that, prior to conducting longitudinal comparisons, measurement invariance across time points must be tested for the self-report instrument used. This is to confirm the stability of the factor structure, loadings, and intercepts, ensuring that observed changes genuinely reflect variations in the latent variable rather than stemming from interpretational biases inherent to the measurement tool itself.

2.2 Latent Variable Model-Based Methods for Identifying Developmental Trajectory Categories

2.2.1 Analysis Using Unconditional Latent Growth Models

The first step in the analysis involves establishing an unconditional latent growth model. This model aims to delineate the overall pattern of change in empathy at the group level. By constructing linear or curvilinear growth models, it is possible to estimate the mean intercept and slope, which represent the group's average initial level and average rate of change, respectively. Simultaneously, the model estimates the variance of the intercept and slope, as well as their covariance. Significant variance indicates substantial individual differences in both the initial level and the rate of change, thereby providing statistical justification for subsequently exploring heterogeneous trajectory categories.

2.2.2 Growth Mixture Modeling and Trajectory Category Exploration

Upon confirming significant between-individual differences, latent growth mixture modeling is employed to explore potential, qualitatively distinct subgroup trajectories. The analysis begins by fitting a model with one class, incrementally increasing the number of classes. Model selection relies on a combination of statistical indices and theoretical interpretability: lower Bayesian Information Criterion values, higher entropy values, and significant Lo-Mendell-Rubin likelihood ratio test results all suggest a better model fit. Simultaneously, the posterior probability of each class, the proportion of the sample assigned to it, and the theoretical meaningfulness of the trajectory shape must be carefully evaluated. The final determined model should clearly present several distinct trajectories, such as a "consistently high-stable group," a "moderate-start linear-growth group," a "low-start late-acceleration group," and a "high-start decline or fluctuation group."

2.2.3 Model Validation and Robustness Testing

The identified trajectory categories require robustness testing to enhance the reliability of the conclusions. This includes conducting cross-validation using random split-half samples, observing the stability of the class structure after controlling for covariates, and comparing the consistency of results under different model specifications. Furthermore, the trajectory category results can be subjected to correlational analysis with external criterion variables. This tests whether members of different trajectories exhibit expected differences in key variables such as internship outcomes and professional identity, thereby providing empirical support for the validity of the trajectory categories^[3].

2.3 Examining Group Heterogeneity in Initial Levels and Rates of Change

2.3.1 Multivariate Prediction Models with Trajectory Class as the Outcome Variable

Using the most likely trajectory class membership obtained from the LGMM analysis as an

unordered categorical dependent variable, a multinomial logistic regression model is constructed. This model is used to investigate the relative risk ratios of baseline time-invariant covariates for belonging to a specific trajectory class. Predictor variables can include demographic background, personality traits, baseline scores on emotion regulation strategies, among others. Through this analysis, it is possible to identify which individual characteristics significantly predict a higher likelihood of following a specific developmental path — for instance, whether individuals with weaker emotion regulation abilities are at higher risk of belonging to the "fluctuating group."

2.3.2 Multilevel Regression Analysis Conditional on Growth Parameters

An alternative method offering greater statistical power involves constructing conditional latent growth models or hierarchical linear models. Within this framework, the initial level and rate of change are treated as latent variables or random effects, allowing for the direct examination of the influence of predictor variables at the individual or contextual level. The model can estimate the unique effects of predictor variables on the intercept and slope. For instance, it can investigate whether the level of social support at the beginning of the internship is not only associated with a higher initial level of empathy but may also buffer against a decline in the rate of change. This analytical approach enables a more nuanced understanding of the specific mechanisms through which variables affect different aspects of the developmental process.

2.3.3 Influence of Time-Varying Covariates and Their Modeling

The development of empathy does not occur in a vacuum; specific events or fluctuations in psychological states during the internship may influence its developmental path. This is addressed by constructing models that incorporate time-varying covariates. For example, by including measures such as work-related stress or the frequency of reflective learning activities from each wave as time-varying covariates in a multilevel model, it is possible to analyze how within-person fluctuations in these variables are associated with within-person fluctuations in empathy. This reveals dynamic, proximal influence processes. This approach provides the potential to understand fluctuations within trajectories, thereby linking macro-level trajectories with micro-level processes^[4].

3. Multilevel Systemic Factors Influencing the Developmental Trajectory of Clinical Empathy

3.1 The Predictive Role of Individual Cognitive-Affective Regulatory Mechanisms on Trajectory Patterns

3.1.1 The Foundational Effect of Early Cognitive Schemas and Affective Response Tendencies

The cognitive schemas individuals have formed regarding illness, suffering, and the doctor-patient relationship before entering clinical internships constitute the initial framework for processing clinical information. Individuals holding rigid biomedical schemas may be more inclined to objectify patients, thereby potentially delaying the development of their affective resonance dimension. Accompanying these are relatively stable individual affective response tendencies, such as affective sensitivity within trait empathy. Individuals with high affective sensitivity might exhibit strong affective resonance in the initial stages, yet may also experience trajectory fluctuations or decline in later phases due to emotional exhaustion. These relatively stable trait factors collectively preset the starting point and early reaction patterns of the developmental trajectory, serving as significant predictors of heterogeneous trajectory categories.

3.1.2 The Dynamic Regulatory Role of Emotion Labor Strategy Use

Emotion labor strategies serve as proximal mechanisms regulating the slope of the trajectory. Habitual use of surface acting is prone to lead to emotional exhaustion and is associated with a "rise-then-fall" trajectory. In contrast, individuals capable of employing deep acting strategies, who achieve alignment between internal feelings and professional expression through cognitive reappraisal, are more likely to exhibit a trajectory of stable adaptive growth. This difference in strategy effectiveness explains why, under similar situational conditions, significant variations exist in the rate of change of individuals' empathy.

3.1.3 The Developmental Contribution of Metacognitive Monitoring and Executive Functions

As a complex socio-cognitive ability, the development of empathy cannot be separated from higher-order cognitive monitoring functions. Metacognitive monitoring enables individuals to reflect on their own cognitive and affective states during clinical interactions, identify comprehension biases,

and make adjustments, which is crucial for the accuracy and depth of empathy. Executive functions, particularly cognitive flexibility and response inhibition, assist individuals in maintaining professional boundaries and avoiding excessive personal involvement when confronted with patients' intense negative emotions or complex clinical situations. The developmental maturity of these "cognition about cognition" abilities likely determines whether an individual can effectively learn from and integrate repeated clinical experiences, thereby supporting a sustained and robust upward trajectory.

3.2 Influence Pathways of Clinical Learning Environment Characteristics and Social Interaction Patterns

3.2.1 The Subtle Shaping by Contextual Symbolic Meanings and Affective Atmosphere

Each specific clinical department possesses a unique system of symbolic meanings and a distinct affective atmosphere. The high-pressure, technologically-intensive environment of an intensive care unit, the emphasis on end-of-life care in a hospice ward, and the interactive nature of a pediatric ward respectively convey different hidden curricula concerning "efficiency versus life," "companionship and dignity," and "communication and reassurance." The tacitly permitted rules for emotional expression and the focus of attention within these contexts continuously shape the interns, guiding the allocation of their empathic resources. An environment that encourages emotional expression and values communication may foster the integrated development of the affective and behavioral dimensions of empathy. Conversely, a highly technical environment that avoids emotional discussion may confine the development of empathy to the cognitive dimension and even induce emotional numbing.

3.2.2 Mentor-Intern Interaction Patterns and the Quality of Observational Learning

Within the clinical environment, interaction with clinical instructors and senior nurses constitutes the core learning mechanism. The empathetic behaviors demonstrated by the instructors themselves provide the most direct observational learning model for the interns. More influential is the feedback pattern within these interactions: whether feedback merely evaluates technical performance or can provide "process-oriented feedback" on the intern's interaction process with patients; whether it only points out mistakes or can demonstrate how to think from the patient's perspective. A guiding, reflective mentor-intern interaction can effectively enhance the intern's mind-reading ability and translate it into concrete behaviors. Conversely, interactions lacking feedback or solely focused on task completion leave the development of empathy at a spontaneous and incidental level.

3.2.3 Peer Support Networks and Normative Social Influence

Peer networks provide a space for emotional buffering and meaning negotiation. The shared perception within the group regarding the value of empathy creates a powerful normative pressure. When the group views it as a core professional competency, a positive social facilitation effect emerges. Conversely, if it is perceived as secondary, it may suppress an individual's engagement and developmental motivation, thereby shaping both the overall developmental trend of the group and the convergence of individual trajectories.

3.3 The Role of Critical Life Events and Reflective Learning in Trajectory Transitions

3.3.1 Defining Clinical Events and Their Emotional Impact

Clinical events characterized by high emotional salience and cognitive disruptiveness constitute potential turning points in the trajectory. Instances such as first encountering patient death or being involved in a medical error can violently disrupt the existing cognitive framework. The outcome of such experiences depends on the interaction between the nature of the event, its timing, and the individual's available resources. This interaction may catalyze stepwise growth or lead to temporary stagnation or decline.

3.3.2 The Process of Meaning-Making and Narrative Integration

The direction of the transition is not determined by the event itself but depends on the subsequent process of meaning-making. Transforming emotional experiences into structured professional knowledge through narrative integration is the core cognitive process for completing a developmental transition. Successful integration can deepen the understanding of the patient's situation, manifesting as a positive turning point in the trajectory; conversely, failure to integrate may lead to the formation of persistent emotional knots.

3.3.3 The Nature of Reflective Learning and the Sustenance of Trajectory Momentum

The routine habit of reflection that extends beyond specific events determines the long-term momentum of the trajectory. Technical reflection offers limited promotion of empathy. In contrast, practical reflection and critical reflection can prompt individuals to continuously extract insights from daily interactions, subtly adjusting their empathic responses. This provides an intrinsic driving force for the ongoing evolution of empathy, preventing its development from reaching a plateau of stagnation.

Conclusion

This study establishes a comprehensive research pathway for investigating the developmental trajectory of clinical empathy in nursing interns and its influencing factors through a systematically constructed theoretical framework and methodological strategy. The anticipated findings are expected to confirm that the development of clinical empathy is not a uniform, linear process but exhibits significant group heterogeneity, manifesting as several characteristic trajectories with distinct shapes and rates of change. Differences among these trajectories can be jointly predicted and explained by intrinsic mechanisms, such as individuals' early cognitive-affective schemas, the emotion labor strategies they employ, and metacognitive abilities, in conjunction with extrinsic systemic factors including the hidden curriculum of clinical environments, the quality of mentor-intern interactions, and peer norms.

Critical clinical events, along with individuals' reflective practices and meaning-making processes concerning these events, may trigger significant turning points in the trajectory at specific times. The theoretical contribution of this study lies in integrating developmental and systemic perspectives, thereby deepening the understanding of the formation process of professional psychological competencies. Its methodological significance lies in demonstrating how advanced latent variable models can be employed to analyze complex change patterns within longitudinal data. Future research directions may include cross-cultural comparisons of trajectory patterns in different cultural contexts, the development of preventive interventions based on the early identification of trajectory categories, and the integration of physiological measurement indicators to explore the psychophysiological synergistic mechanisms underlying empathy development.

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