Enhancing Nursing Assistant Attitudes Towards Geriatric Caregiving through Transmodal Ordered Network Analysis

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Abstract. In my thesis, I am investigating the application of Transmodal Ordered Network Analysis (TONA) to analyze and visualize geriatric caregiving attitudes, aiming to enhance caregiver perceptions through an immersive VR simulation. Specifically, my research focuses on three main objectives: (1) identifying disparities between real-life caregiving experiences and previous training, (2) improving our VR training by integrating findings from the initial phase and (3) conducting a detailed TONA within the VR simulation. The first two objectives have been almost addressed, setting a strong foundation for the most crucial part of my research. The third objective involves a detailed analysis using TONA, utilizing gaze data, facial expressions, conversational dialogues, and embodiment data to monitor changes in caregiver attitudes within the immersive simulation featuring a virtual geriatric patient. Merging these diverse data types into a unified analysis presents challenges due to the complexities of multimodal data integration. Therefore, a key aspect of my thesis is enhancing methodologies to incorporate multichannel data analysis in TONA. The findings of this thesis are expected to make a significant contribution to the fields of nursing education, quantitative ethnography, and human-computer interaction.

Keywords: Epistemic Network Analysis · Nursing Education · Multimodal Data · Virtual Reality · Transmodal Ordered Network Analysis.

1 Background and Goals of the Research

An emergent challenge in geriatric care is improving the quality of care, which requires insights from stakeholders and comprehensive training. Caregivers play an enormous role in aging care, but inadequate training limits their effectiveness and affects their attitudes toward working with seniors. Experts recognize the need to develop practical skills and suggest creating learning environments to better prepare caregivers [4]. Simulation methods, on the other hand, may better prepare trainees for direct interactions in a realistic clinical setting [1].

In response to this need, the research seeks to: 1) identify and analyze the disparities between real-life caregiving experiences and the training caregivers previously received. This involves understanding how actual caregiving differs

from the scenarios and techniques taught during training. By analyzing healthcare expert interviews using Epistemic Network Analysis (ENA), we revealed the meaningful connections between key elements of care. 2) enhance our Virtual Reality (VR) training program by integrating insights gained from the initial analysis. This includes developing and adding new training modules that better reflect real caregiving situations and the complex needs of geriatric patients. 3) conduct a comprehensive Transmodal Ordered Network Analysis (TONA) within the VR simulation.

Recently, emerging data sources like embodiment, eye tracking, and facial expressions have gained significant attention. Analyses like ENA have been used with learning sciences data, including online discussions, interviews, and learner interactions focusing on single data types. To address this, TONA extends traditional ENA by integrating Ordered Network Analysis, which emphasizes the sequence and order of interactions [2], with Transmodal Analysis, which considers how different communicative modes interact and complement each other [3]. Thus, my research aims to develop a methodology that incorporates multiple data modalities into a unified TONA within the virtual training simulation.

2 Methodology

Previous research has identified key factors essential for effective caregiving and nursing responsibilities, which include Communication, Empathy, Flexibility, and Critical Thinking [4]. We conducted semi-structured interviews with ten trained caregivers. After transcribing and coding the data using aforementioned codes, we used ENA to examine the differences between their real-life caregiving experiences and what they learned in training. The analysis highlighted a significant deficit in empathy within the formal training compared to the actual experiences of caregivers. A more detailed analysis will be presented in the following section. These findings underscore the necessity of incorporating more empathetic training scenarios in our geriatric care simulation.

The next phase of my research will involve a group of certified nursing assistants participating as caregivers in the VR training simulation, which is almost complete. This iteration aims to enhance the training by incorporating scenarios that foster empathy, thus better prepare trainees for realistic clinical interactions. We will collect data using an integrated eye-tracking system within the VR setup, as well as embodied data, facial expressions, and dialogues with the virtual patient. This data will subsequently be analyzed using TONA, where we will strategically employ each training session as stanzas. This approach will enable us to examine the nuanced impact of empathetic training on the performance of caregivers in a controlled VR environment. Fig 1 shows an overview of the study design:

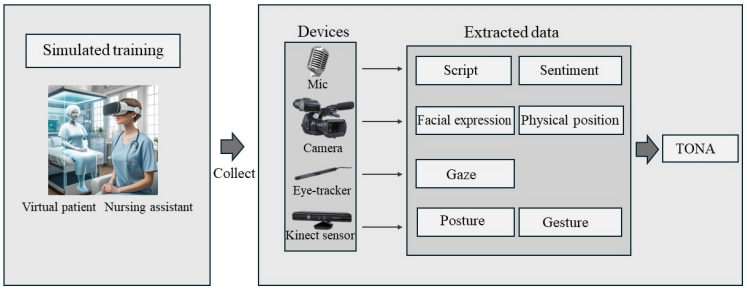

Fig. 1: Overview of the proposed study design for enhancing geriatric caregiving training through Virtual Reality and Transmodal Ordered Network Analysis.

3 Preliminary Findings

We applied ENA to our healthcare expert interview data to analyze caregivers' behavior in their real-life, daily work settings and compared it with the guidelines provided during their training. A two-sample t-test with unequal variances revealed a statistically significant difference between the Real and Training response categories along the X-axis, demonstrating a large effect size. We also separately analyzed each network diagram to determine why this statistically different result was found. The individual diagrams for Real and Training responses are presented in Fig 2.

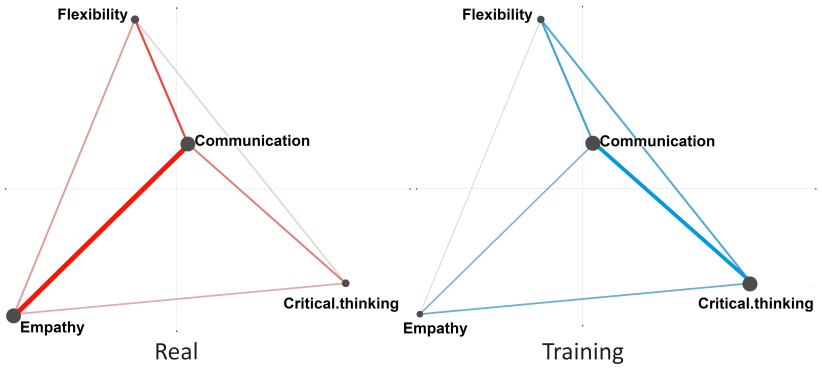

Fig. 2: Epistemic network representations of participant responses in an expert interview process based on Real (red) and Training (blue) categories.

4 Expected Contributions

The anticipated outcomes of this study have the potential to significantly contribute to the fields of nursing education, healthcare, and QE research in several ways:

1) By utilizing quantitative analysis techniques to examine the networks of cognitive skills, the study will provide valuable insights and deepen our understanding of the cognitive processes involved in interacting with older adults. This is crucial for developing training that more accurately reflects the complexities and demands of real-world caregiving.

2) Additionally, by focusing on incorporating underrepresented scenarios in training, the research aims to bridge the gaps often found in caregiver training. This could lead to better patient outcomes and more satisfying caregiver-patient interactions in real settings.

3) This approach of integrating multiple data types into Transmodal Ordered Network Analysis represents a novel contribution to the field. This multimodal methodology could potentially be applied in other domains where understanding complex human interactions is crucial.

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