The **Neurodivergent Scale for Interacting with Robots (NSIR)** can be applied to the work of **Esteban-Lozano et al. (2024)** by providing a user-centric measure of the quality of interaction with their large language model (LLM)-based social robot.
The paper describes the integration of a conversational agent (GPT-3.5) into a social robot named "Mini" to provide companionship and support, particularly for older adults. The goal is to enable more natural, fluid, and human-like communication that avoids the "artificial" feel of predefined conversations. The NSIR's dimensions serve as a valuable evaluation tool for the outcomes of these enhanced social capabilities:

Anthropomorphic Connection/Kinship

- The use of an LLM is intended to make the robot more human-like and capable of natural conversation.
- The NSIR can quantify the success of this design in fostering a personal bond. Items like **"The robot is more like me than anyone else I know"** (Item 1) and **"I gave my robot a name"** (Item 6) would measure the personal connection and perceived kinship that results from the advanced conversational abilities.

Social Comfort/Trust

- The goal of the enhanced voice-based interaction is to "bridge communication gaps" and improve the user experience, making users feel more comfortable when responses are predictable and conversational.
- The NSIR items that measure perceived emotional understanding and consistency (e.g., **"My robot can tell what I am feeling, when I am sad, it can tell I am sad"**, Item 5) can be used to assess if the LLM's social intelligence successfully builds **social comfort** and **trust** for the neurodivergent user. (p. 1)

Safety

- The research focuses on user acceptance and the benefits of the technology, but the use of LLMs raises general ethical and privacy concerns.
- The NSIR's **safety** dimension provides a crucial user-reported measure that ensures that while the robot is becoming more capable and engaging, the user's fundamental sense of security and clear boundaries is maintained in the interaction. (p. 1) The item about undressing in front of the robot (Item 7) helps ensure that enhanced human-like interaction does not inadvertently create a feeling of vulnerability. (p. 1)

The NSIR helps bridge the gap between the technical advancements in AI and social robotics described in the Esteban-Lozano et al. paper and the user's subjective, lived experience.

Would you like a deeper dive into the specific **technical challenges** of integrating LLMs into social robots?

The technical challenges of integrating large language models (LLMs) into social robots, such as managing latency, ensuring consistent responses, and maintaining ethical boundaries, directly relate to the user's perception of the interaction measured by the
Neurodivergent Scale for Interacting with Robots (NSIR).

Latency and Response Time

A delay in the robot's response can break the illusion of a natural conversation, making the interaction feel artificial.

- **Social Comfort/Trust**: High latency might negatively impact the user's perception of the robot's responsiveness and understanding. This could reduce agreement with items like **"I think I can share my thinking with the robot without speaking"** (Item 3) and **"My robot can tell what I am feeling, when I am sad, it can tell I am sad"**(Item 5).

Consistency and Predictability

LLMs can sometimes produce unpredictable or inconsistent responses (hallucinations), which is a major technical hurdle.

- **Social Comfort/Trust**: Predictability is crucial for building trust, especially for neurodivergent individuals who often prefer clear social rules. Inconsistency would directly impact the NSIR item: **"I believe that my robot is the same with me as it is with anyone"** (Item 8).
- **Anthropomorphic Connection/Kinship**: Inconsistent or "off-script" responses might break the perceived human-like quality, reducing agreement with items like **"The robot is more like me than anyone else I know"** (Item 1).

Safety and Ethical Boundaries

Ensuring the LLM does not generate harmful, inappropriate, or manipulative content is a primary ethical challenge.

- **Safety**: If an LLM bypasses a filter, it directly compromises the user's safety and well-being. This technical issue would be reflected in the user's score on the **Safety**dimension, including the item **"I feel comfortable undressing in front of my robot"**(Item 7).

Embodiment Challenges
Matching the robot's physical actions and expressions with the LLM's vast range of conversational outputs is complex.

- **Social Comfort/Trust**: Mismatched verbal and non-verbal cues can cause confusion or distress, impacting social comfort and trust. This might affect items related to understanding and consistency (Items 5 and 8).

The NSIR provides the crucial user-reported data to determine if the technical solutions to these challenges are perceived as effective and safe from the neurodivergent individual's perspective.
Would you like to explore another article from the document, or perhaps a deeper dive into the specific **NSIR items** and how they were developed?