



Building Safe and Healthy School Communities through an Intervention with Social Robot

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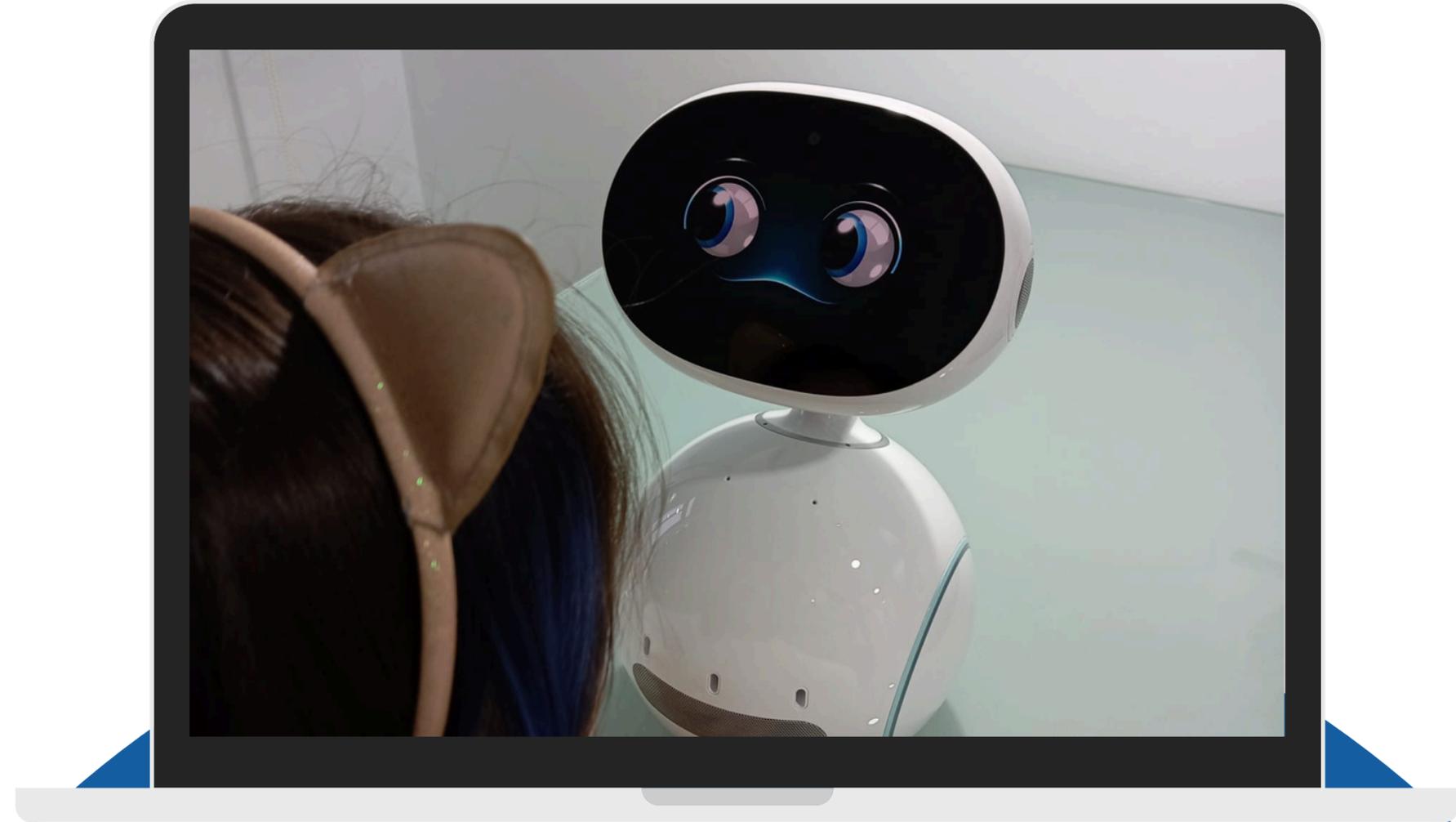
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Exploring the impact of an Intervention with a Social Robot (ISR) on adolescents empathy and prosocial behavior attitudes in schools

In today's rapidly changing world, the need for safe, supportive, and mentally healthy school environments has never been more urgent. With rising concerns about **mental health** and **increasing incidents of violence in schools** innovative solutions are critical.

This study explores **how cutting-edge technologies can transform school communities.**

These tools offer new ways to **support** students' social and emotional growth by **fostering** empathy, and **promoting** prosocial behaviors.

Robot-based intervention

What is it?

The Intervention involves using a Social Robot (ISR), Zenbo, designed to interact with students in the classroom. It supports the development of emotional recognition, empathy, and prosocial behavior. The robot helps students identify their emotions and those of others, fostering moral emotions such as compassion and sympathy.

How does it work?

- Interactive sessions. Students engage in a series of interactive activities with the robot to identify emotions and prosocial behaviors like empathy and compassion.
- Emotion recognition. Through dialogues and tasks, the robot assists students in recognizing their feelings and understanding others' emotions.
- Companion for students. The robot creates a non-judgmental environment, promoting emotional expression.
- Post-intervention reflection. After sessions with the robot, students participate in group discussions to reflect on their experiences, enhancing the long-term impact.



Who took part?

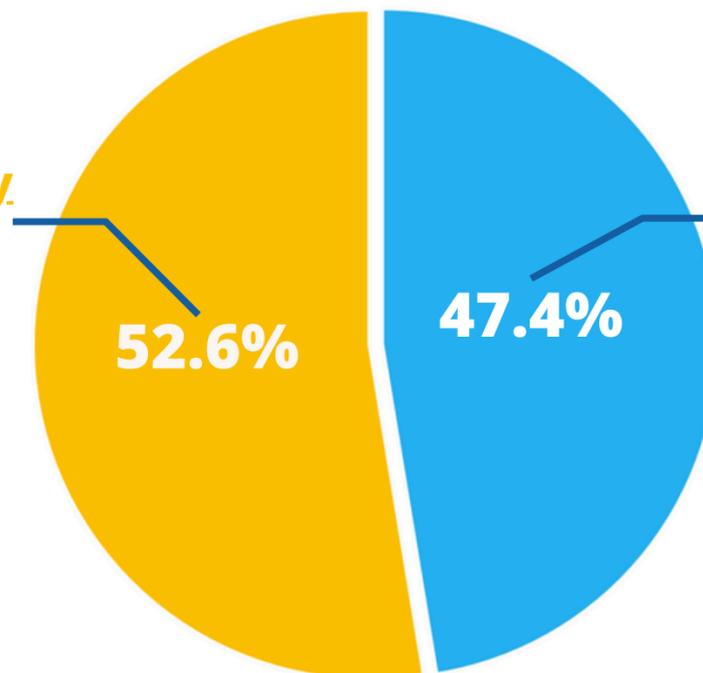
In this study, 325 students from various schools participated, each contributing valuable insights to the research. The participants were nearly evenly split by gender, with 165 girls (50.8%), 159 boys (48.9%), and 1 student (0.3%) identifying as neither.

The participants came from two different grade levels: 171 from 5th grade of primary school (52.6%) and 154 from 6th grade of primary school (47.4%), representing a balanced mix of ages and experiences. This sample allowed us to explore the impact of the interventions across various groups, offering a comprehensive view of the results.

50.8% of participants identified as a **Girl** and 48.9% as a **Boy**.



5th primary school

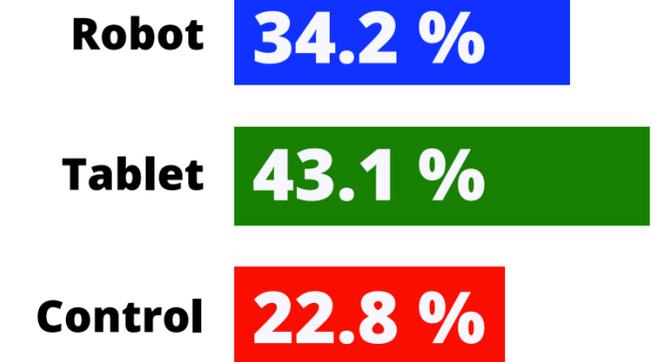


6th primary school

How was the intervention conducted?

The intervention was conducted over multiple stages, gathering data from participants in three distinct groups:

- **Robot Group:** an intervention with Social robot was conducted, designed to help develop students' emotional, empathic, and prosocial beliefs and attitudes.
- **Tablet Group:** a touchscreen device was used, using the same intervention but without the interaction with the robot.
- **Control Group:** no intervention was done.



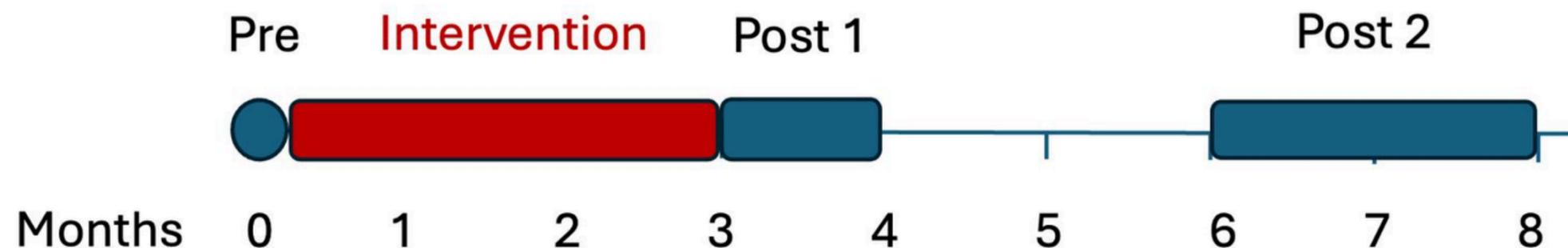
The participants were split across three groups:

- **111 (34.2%) were assigned to the Robot intervention group.**
- **140 (43.1%) to the Tablet intervention group.**
- **74 (22.8%) to the Control group.**

When was the data collected?

Data was collected at three key time points:

1. **Pre-intervention (Pre)**. The initial survey captured **baseline** information about the participants, collected before the intervention.
2. **Post-intervention (Post 1)**. This survey was administered immediately after the intervention to assess its immediate effects. The interventions took place within a 3 to 4-month gap between Pre and Post 1.
3. **Follow-up (Post 2)**. This final survey was conducted approximately 3 to 5 months after Post-1, to evaluate the longer-term impact.



Which indicators were assessed?

PROS

This indicator measured participants' attitudes and beliefs towards prosocial behaviors (PROS), such as helping others, sharing, and cooperating.

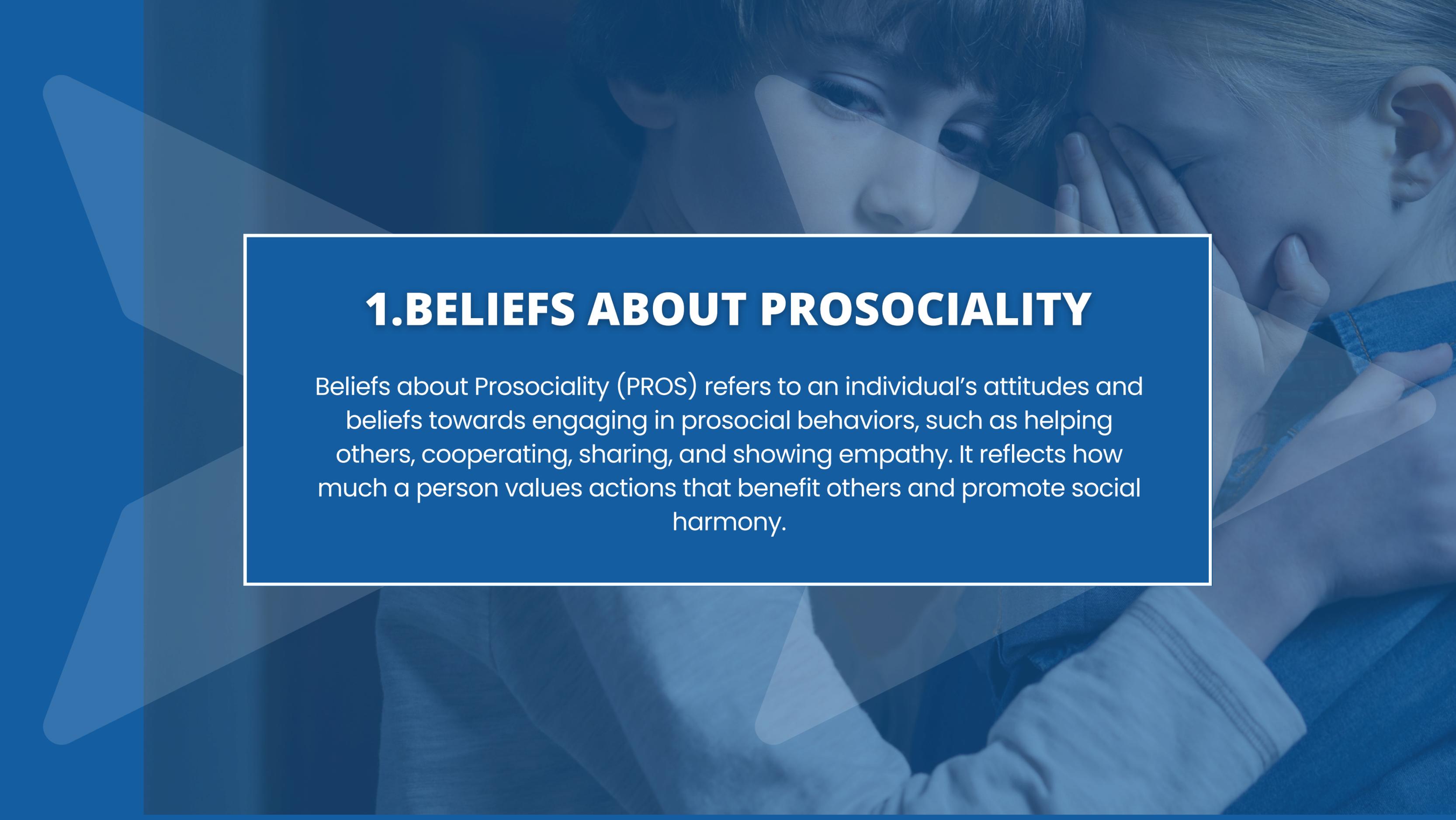
EMPA-COG, EMPA-AFC

These two components of empathy were assessed separately. Affective empathy (EMPA-AFC) focused on participants' emotional responses to others' feelings, while Cognitive empathy (EMPA-COG) measured their ability to understand others' perspectives and emotions.

BLI

This indicator assessed participants' willingness to engage in positive behaviors towards individuals who may have experienced bullying (BLI).



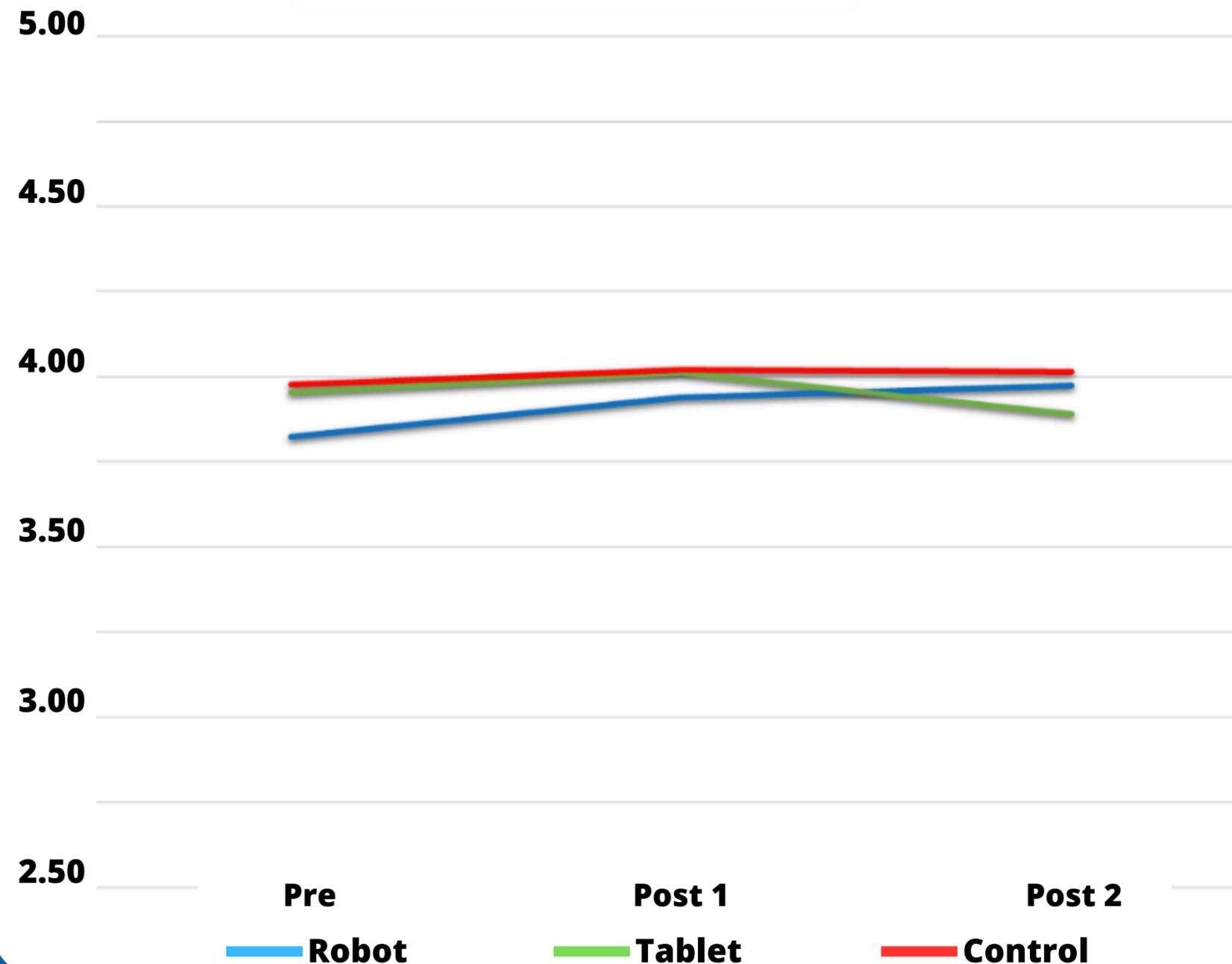


1. BELIEFS ABOUT PROSOCIALITY

Beliefs about Prosociality (PROS) refers to an individual's attitudes and beliefs towards engaging in prosocial behaviors, such as helping others, cooperating, sharing, and showing empathy. It reflects how much a person values actions that benefit others and promote social harmony.

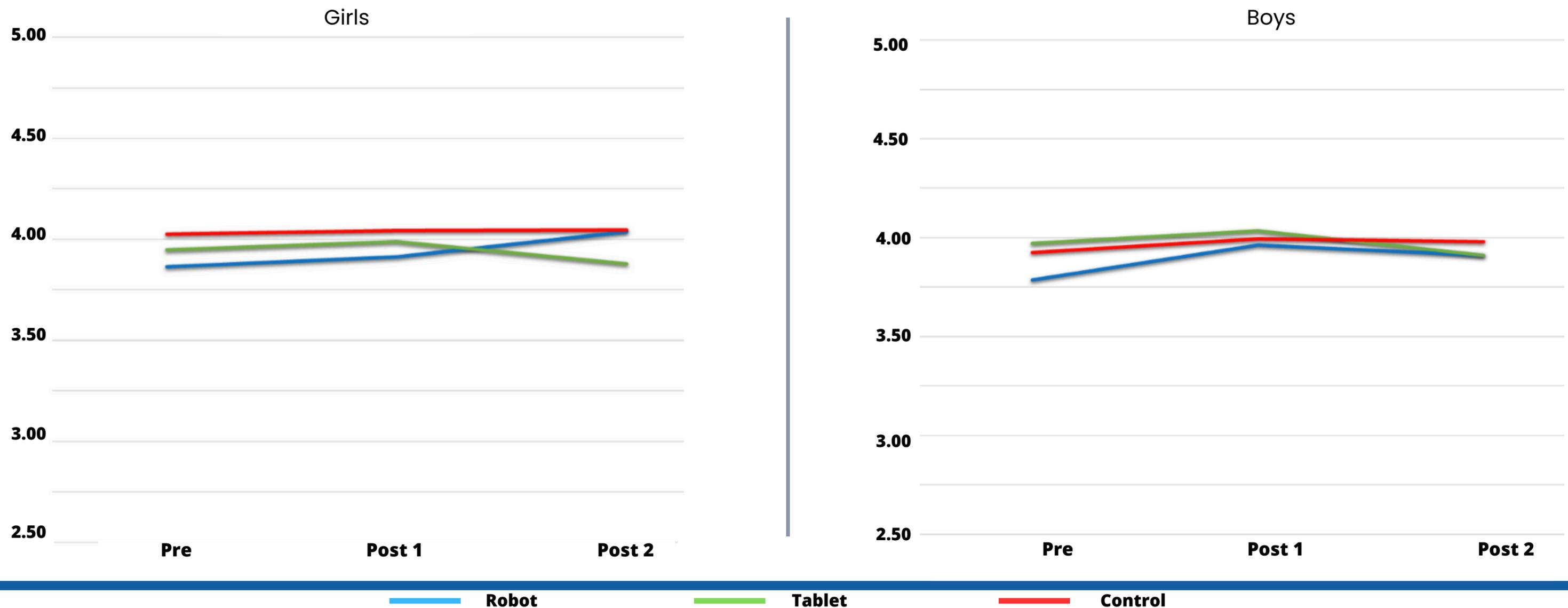
Changes in PROS between different groups

- Robot group showed a significant* improvement in PROS scores from Pre (3.82) to Post 1 (3.94).
- Tablet group experienced a significant decline in PROS scores from Post 1 (4) to Post-2 (3.89), indicating negative long-term effects.
- Control group showed no significant changes in PROS scores across all time points, highlighting the importance of interventions in promoting prosocial behavior.



*When we say an effect is significant, it means that the intervention (such as using robots or tablets) led to a real, measurable change in the behavior or beliefs of students, and not just due to random chance.

Changes in PROS between different groups



Both boys and girls were affected similarly by the interventions.

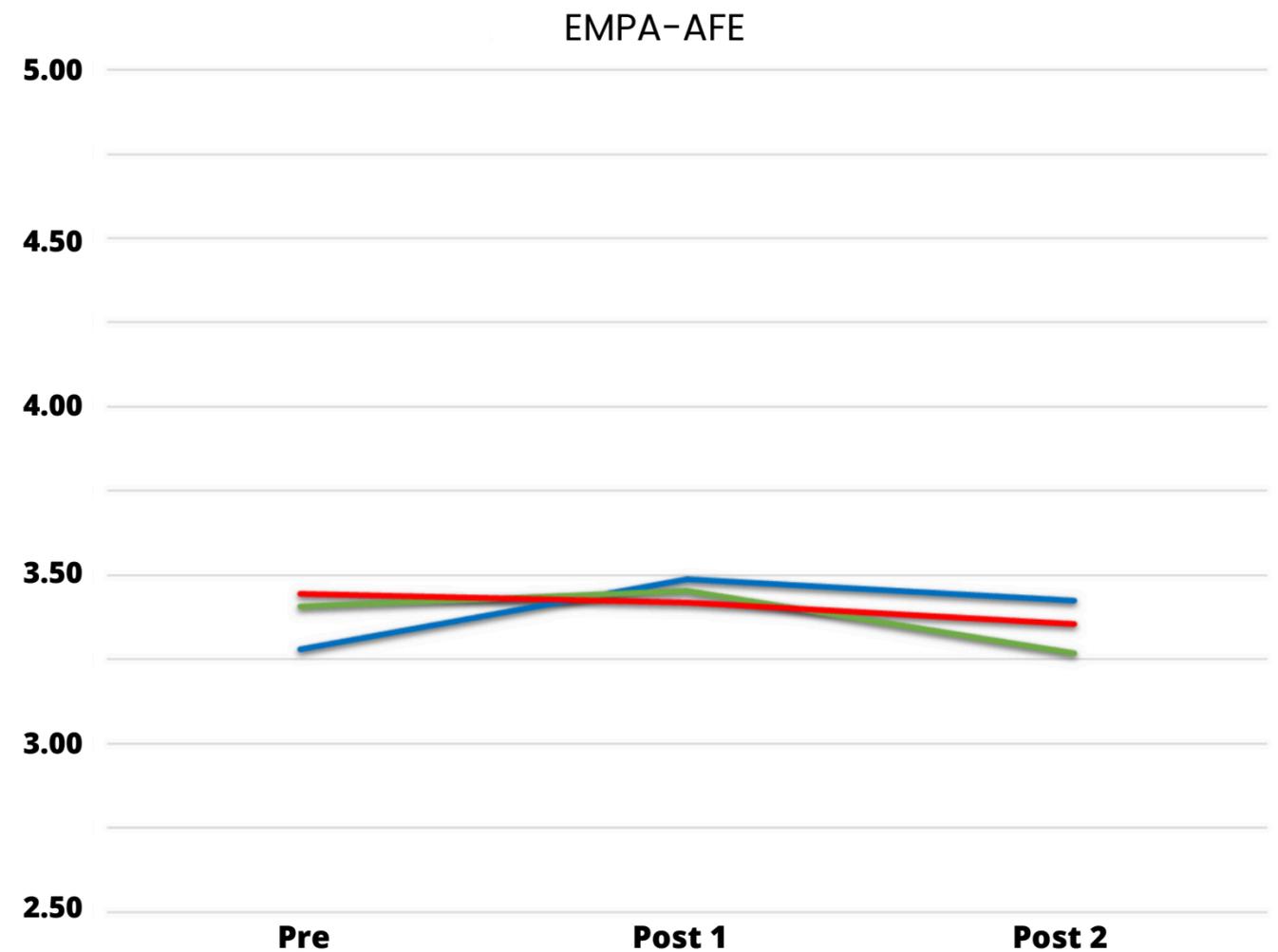
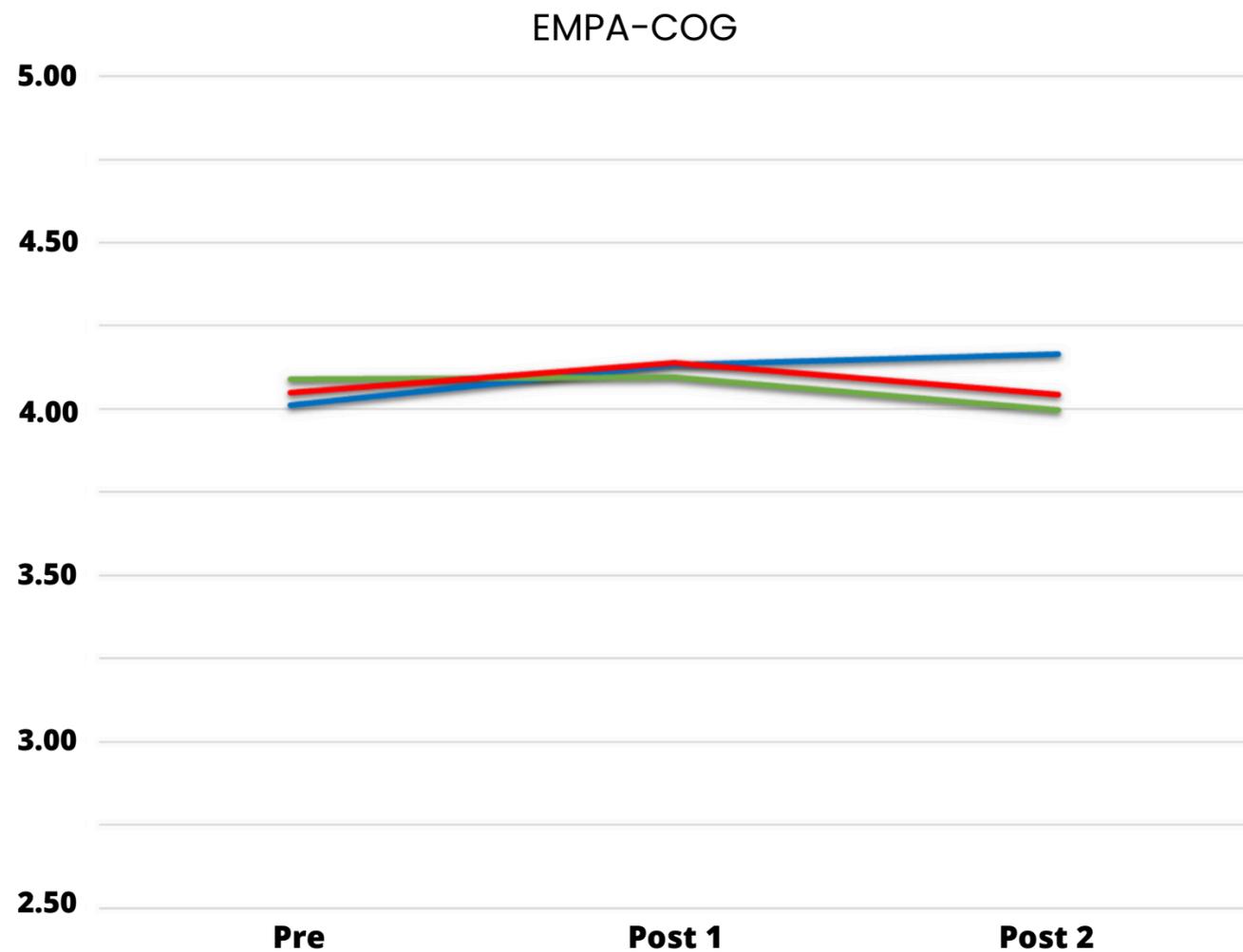
- Robot group, both genders showed significant improvements in PROS scores. The girls' PROS scores increased from Post 1 (3.91) to Post 2 (4.03), while the boys' PROS scores improved from Pre (3.78) to Post 1 (3.96).
- Tablet group for both boys and girls experienced significant declines. Girls' scores decreased from Post-1 (3.98) to Post-2 (3.87), while Boys' scores dropped from Post 1 (4.03) to Post 2 (3.90).
- Control group for both boys and girls showed no significant changes, indicating that prosocial behavior remained stable without intervention.

2. AFFECTIVE AND COGNITIVE EMPATHY

Affective and cognitive empathy are two key aspects of empathy assessed separately in the study. Affective empathy (EMPA-AFC) refers to the emotional responses individuals have to the feelings of others, while cognitive empathy (EMPA-COG) involves the ability to understand and recognize the perspectives and emotions of others.

Together, these components provide insights into how participants connect both emotionally and cognitively with those around them.

Changes in EMPA-COG and EMPA-AFC between different groups



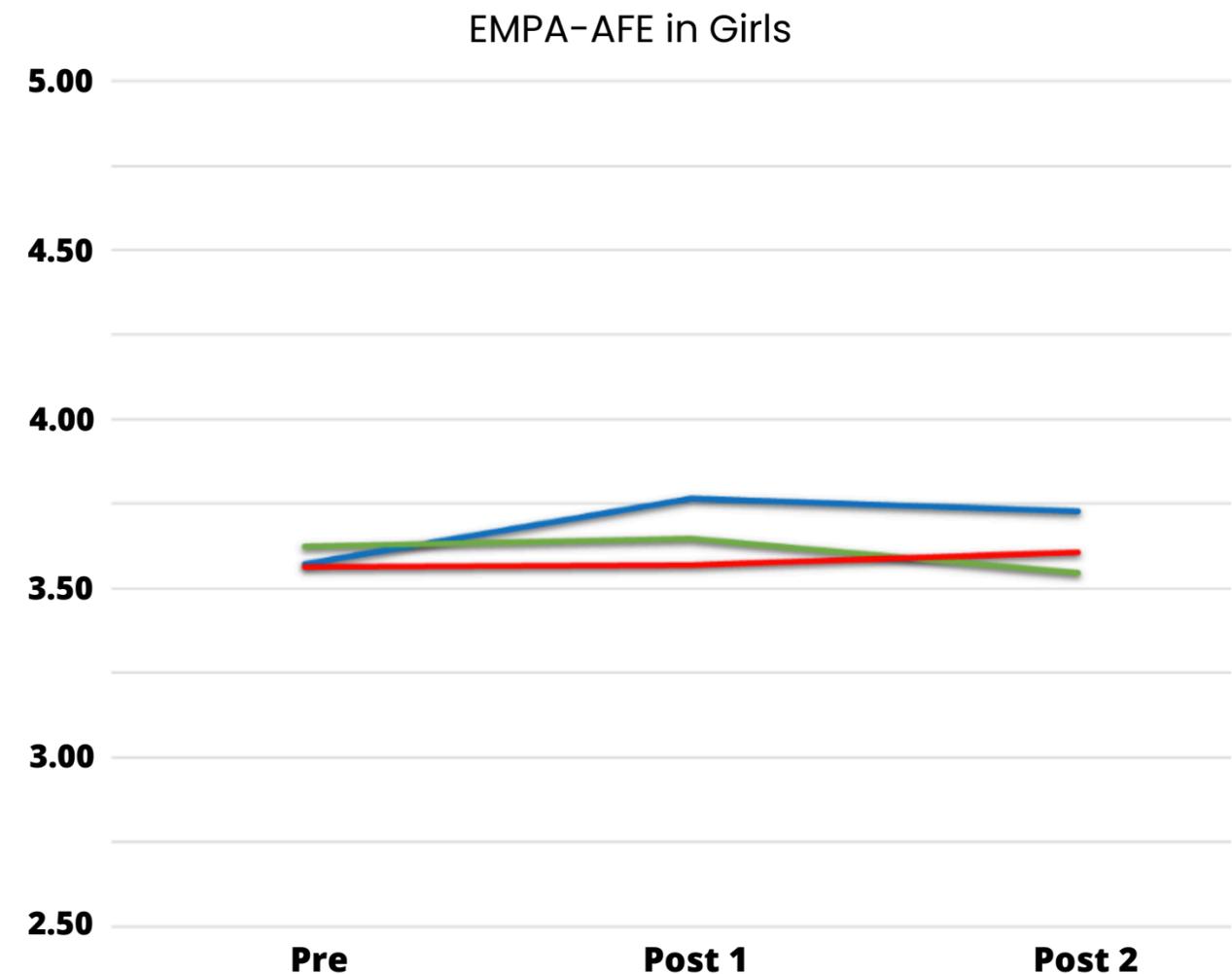
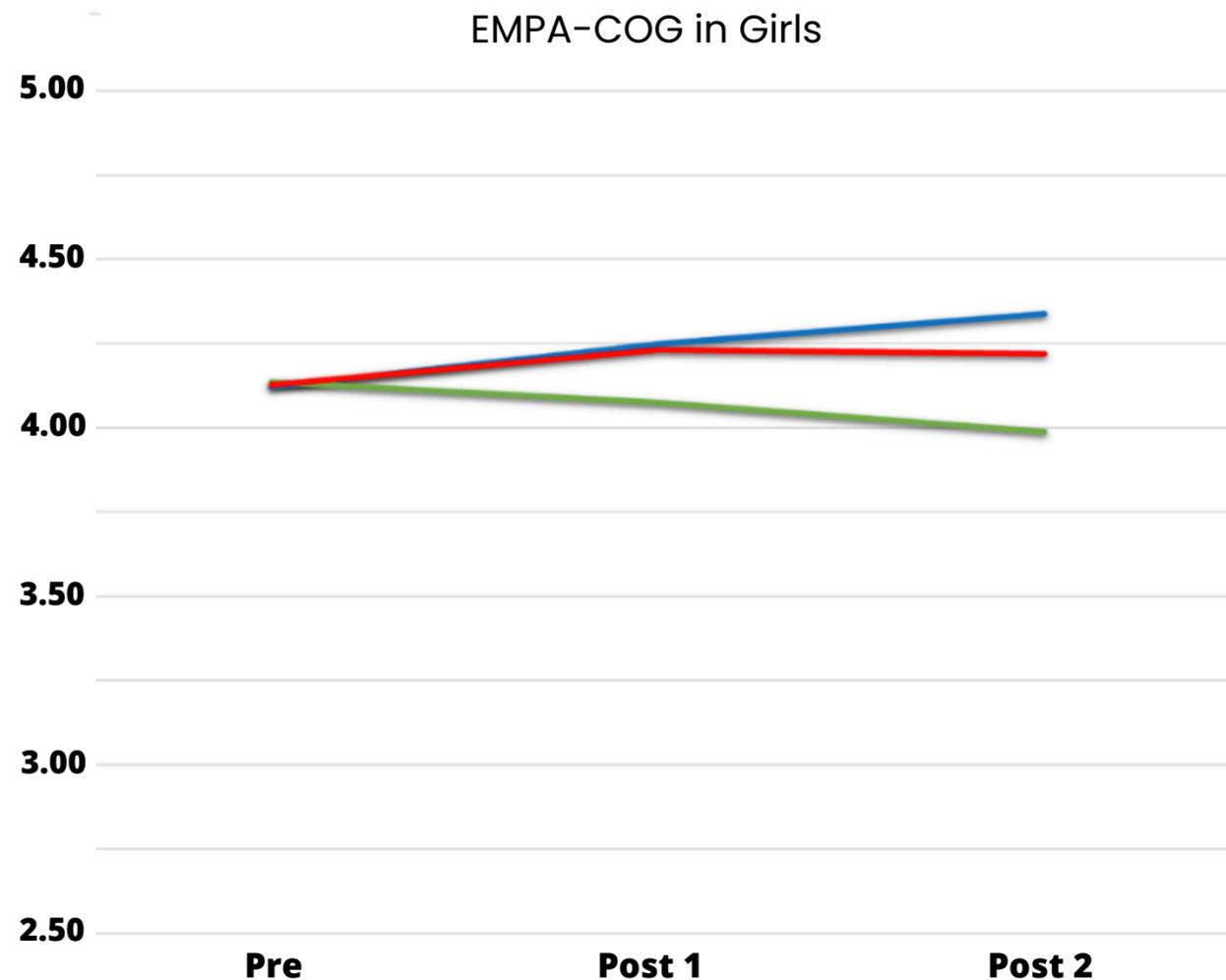
— Robot

— Tablet

— Control

- Robot group demonstrated the most significant improvements in both cognitive empathy (from 4.01 at Pre to 4.13 at Post 1) and affective empathy (from 3.27 at Pre to 3.48 at Post 1).
- Tablet group showed a significant decline in cognitive empathy (from 4.08 at Post 1 to 3.99 at Post 2) and affective empathy (from 3.40 at Post 1 to 3.26 at Post 2), suggesting negative long-term effects.
- Control group showed no significant changes in either form of empathy.

Changes in EMPA-COG and EMPA-AFC between different groups

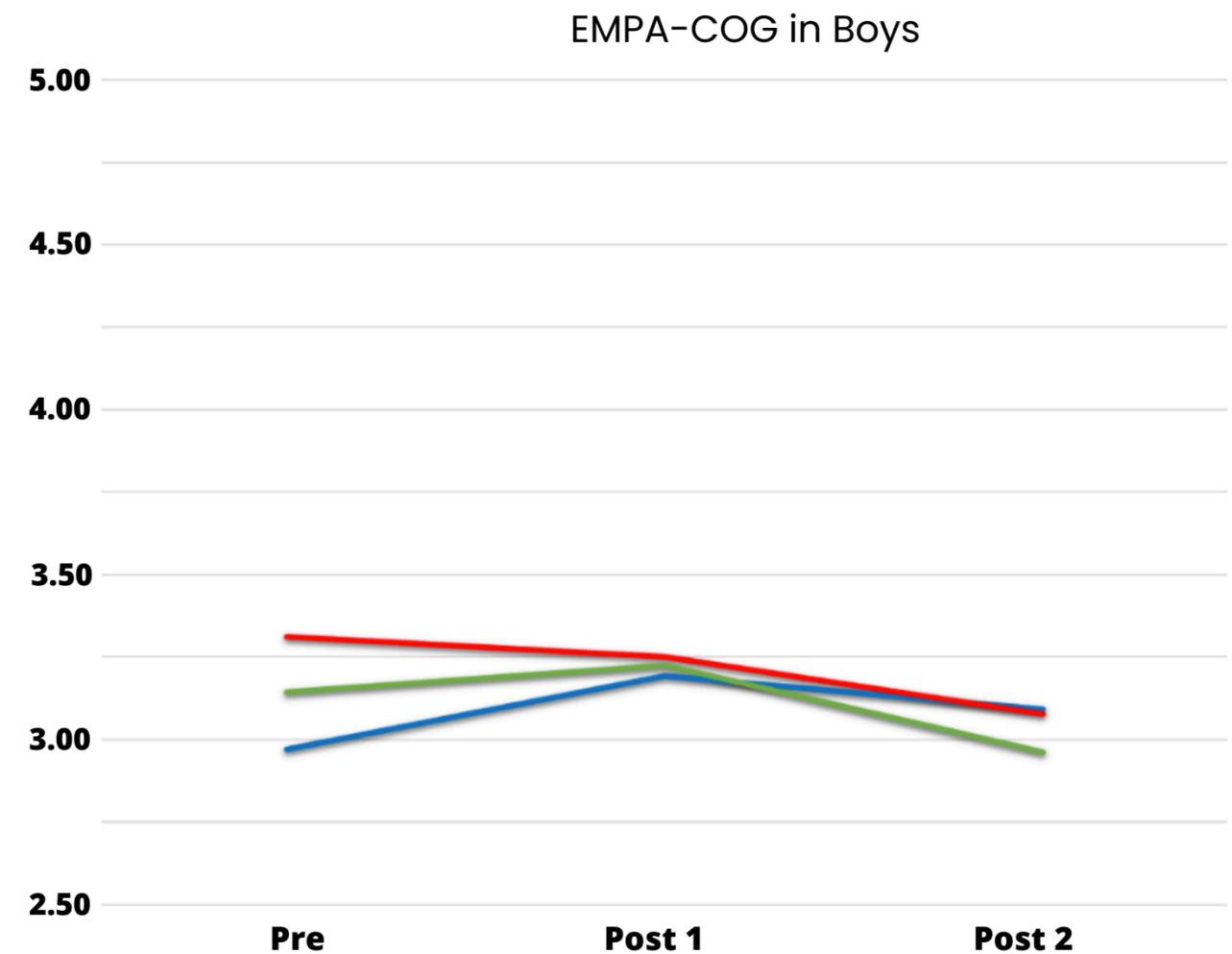
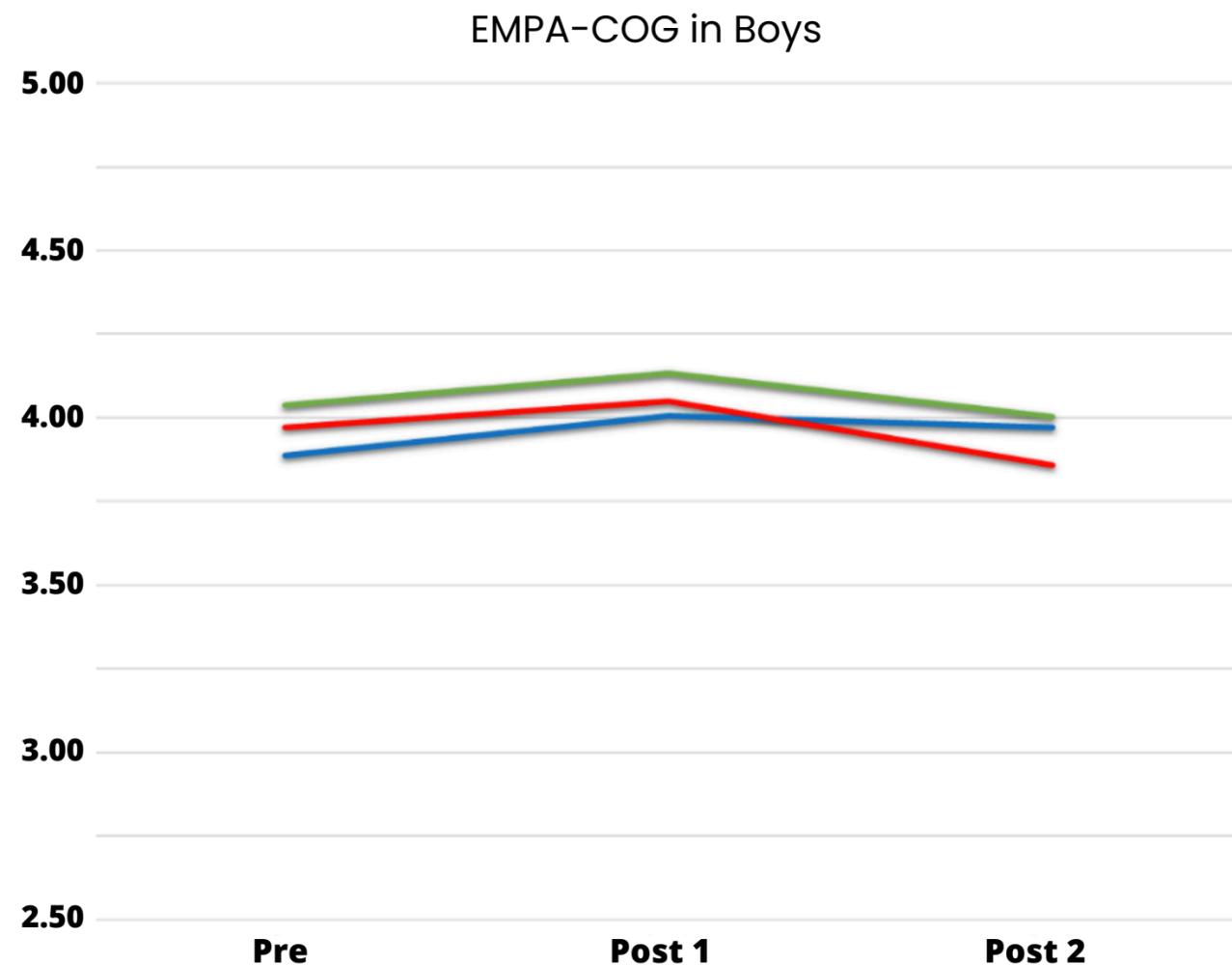


— Robot — Tablet — Control

For the girls sample:

- Robot group showed a significant improvement in affective empathy, increasing from 3.57 at Pre to 3.76 at Post 1.
- Tablet group and Control group showed no significant changes in either affective empathy or cognitive empathy.

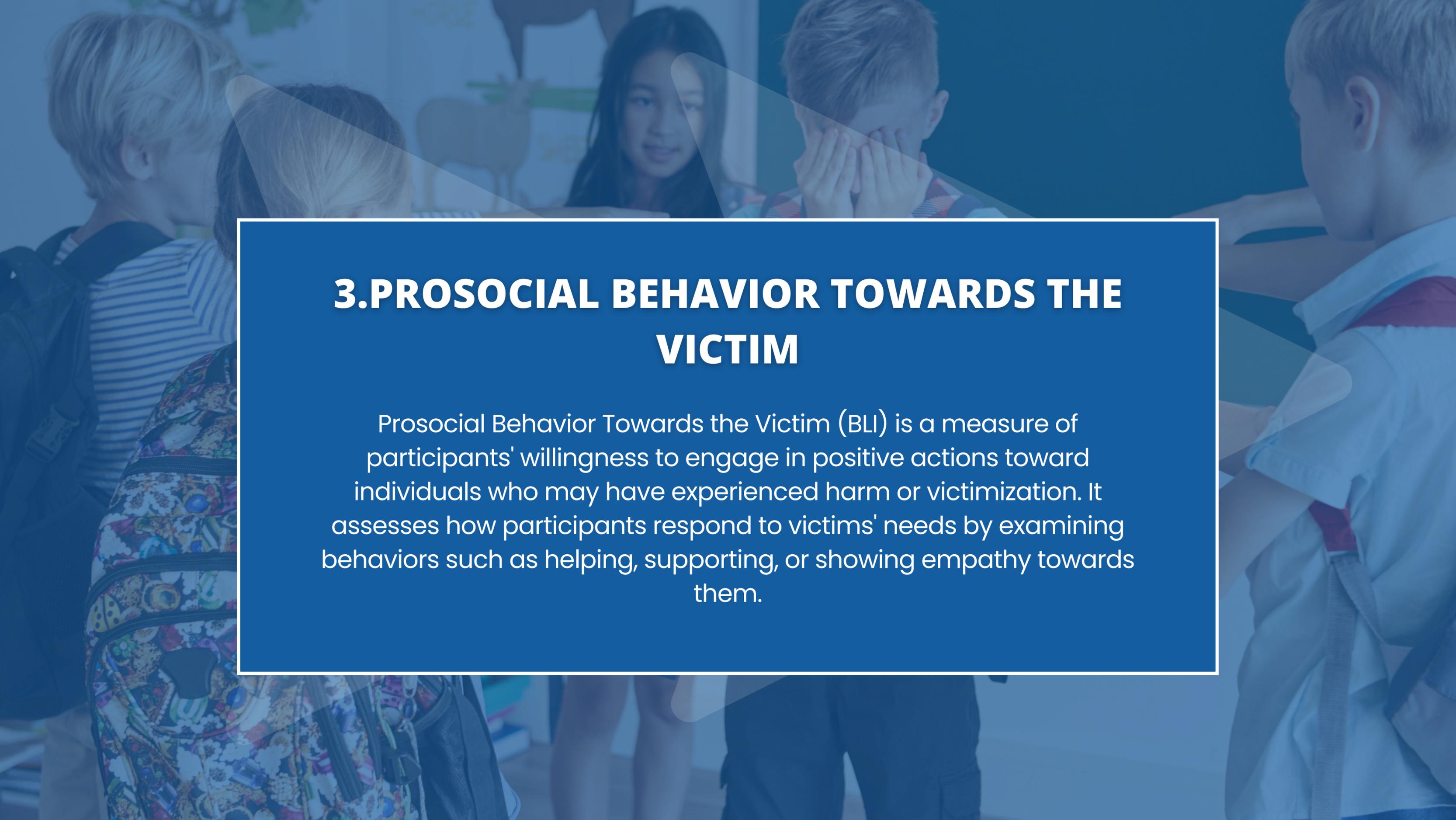
Changes in EMPA-COG and EMPA-AFC between different groups



— Robot — Tablet — Control

In the boys sample:

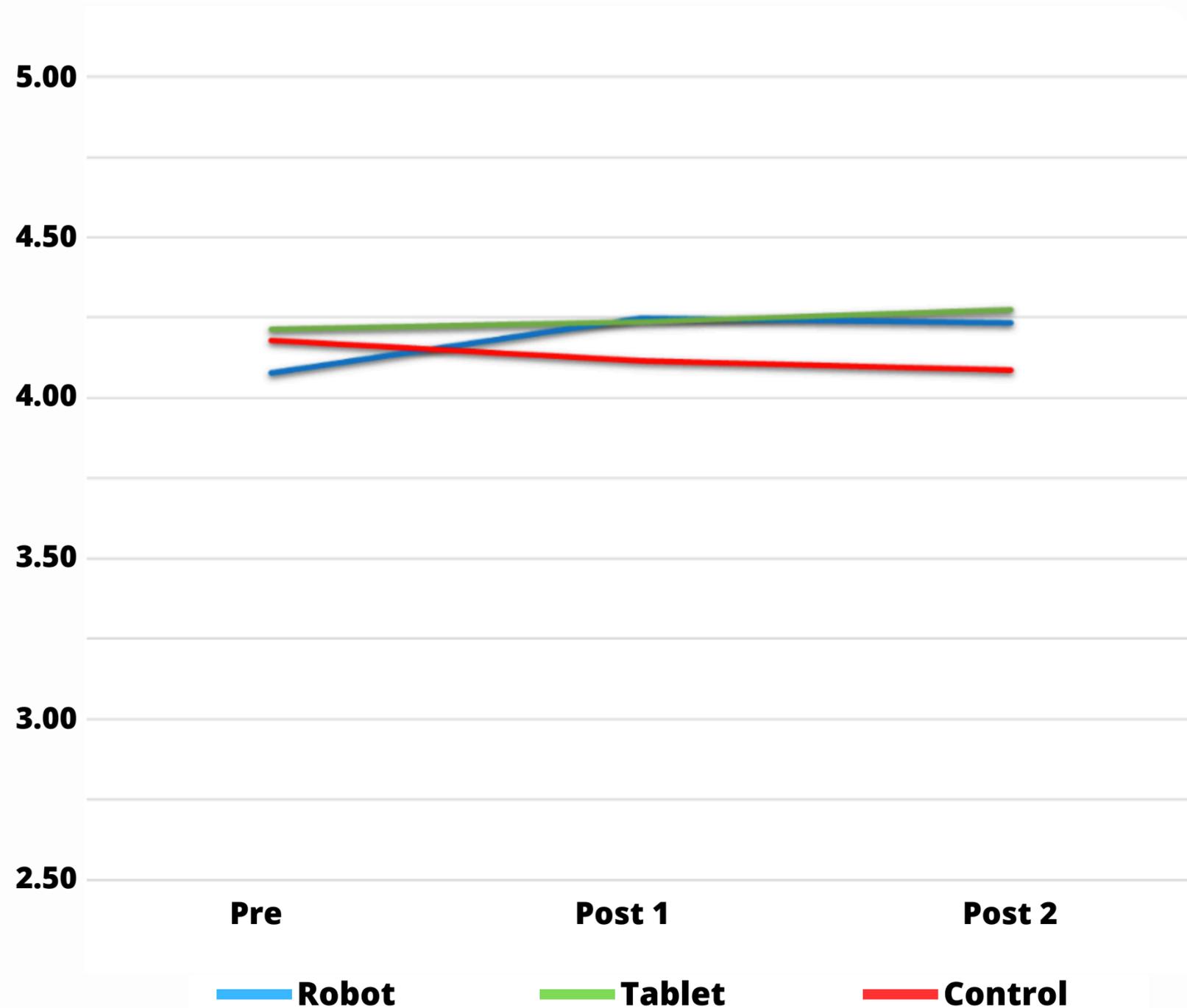
- Robot group showed a significant improvement in affective empathy, from 2.96 (Pre) to 3.19 (Post 1).
- Tablet group showed significant declines in affective empathy from 3.19 in Post 1 to 3.09 in Post 2.
- There were no significant changes in the Control group.

A group of children in a classroom setting. In the center, a young boy is covering his face with his hands, appearing distressed or crying. Other children are visible around him, some looking towards him. The scene is overlaid with a semi-transparent blue filter.

3. PROSOCIAL BEHAVIOR TOWARDS THE VICTIM

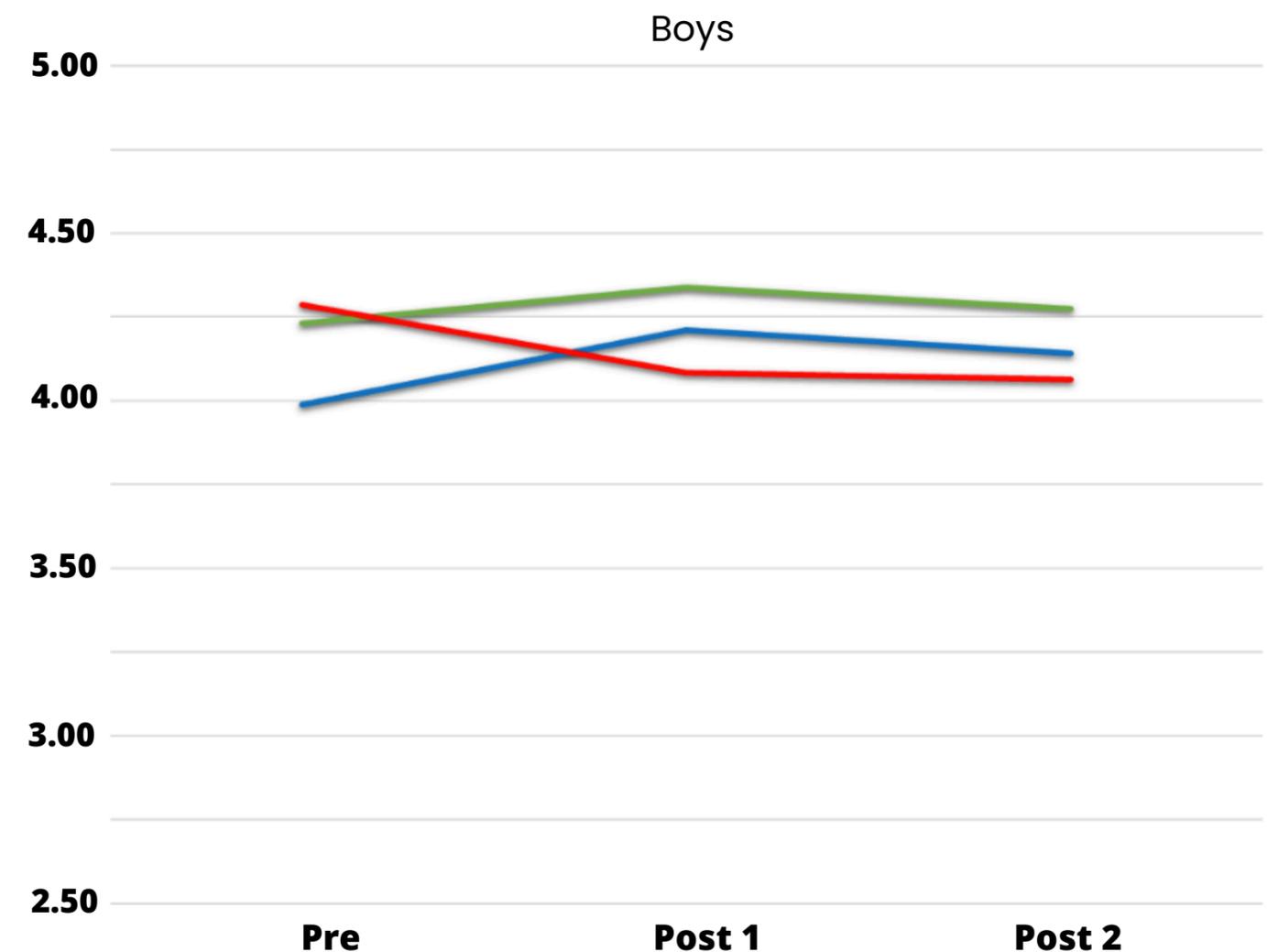
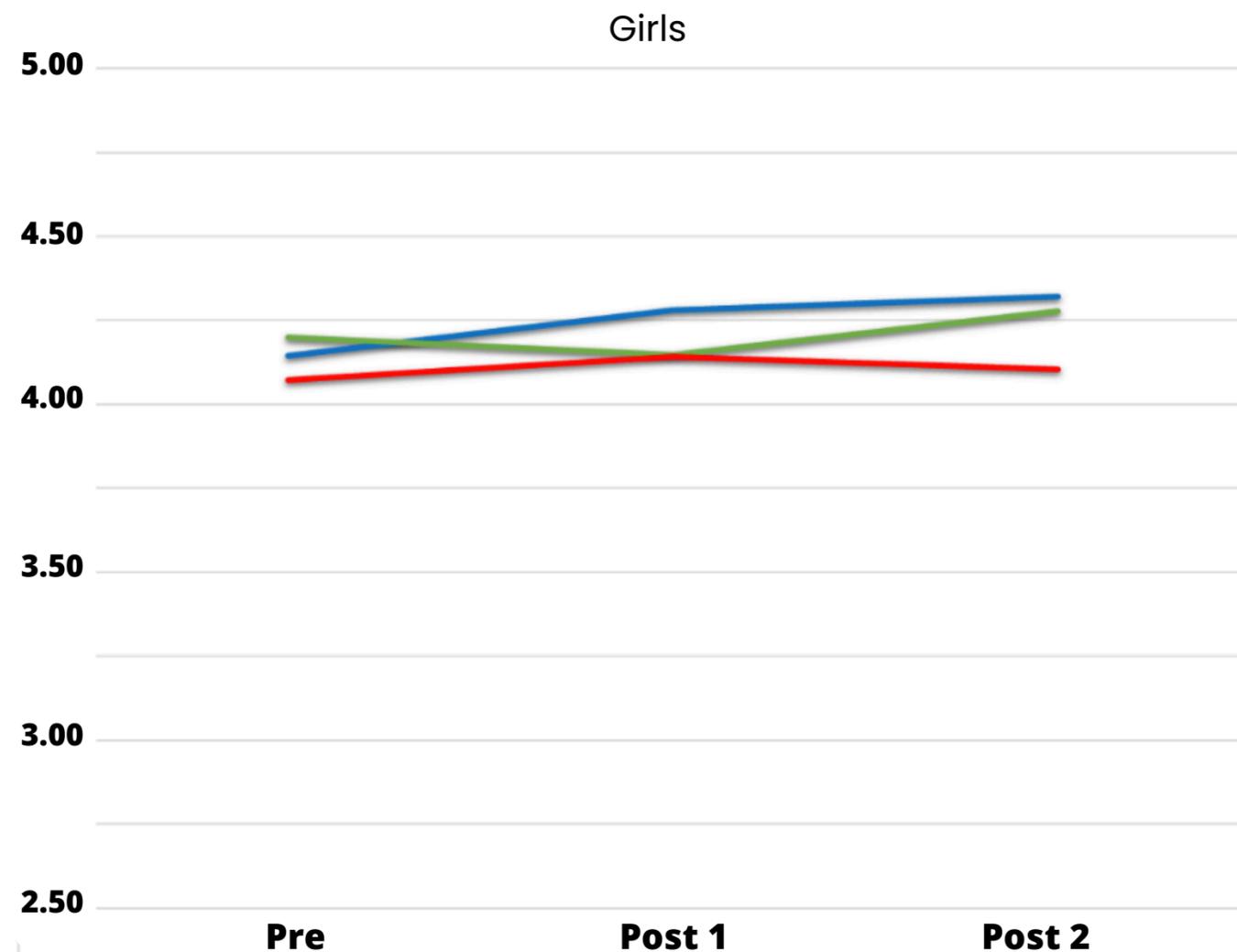
Prosocial Behavior Towards the Victim (BLI) is a measure of participants' willingness to engage in positive actions toward individuals who may have experienced harm or victimization. It assesses how participants respond to victims' needs by examining behaviors such as helping, supporting, or showing empathy towards them.

Changes in BLI between different groups



- Robot group showed significant improvements in prosocial behavior toward victims from Pre (4.07) to Post 1 (4.24).
- Tablet group and Control group showed no significant changes.

Changes in BLI between different groups



— Robot — Tablet — Control

For both the girls and boys samples:

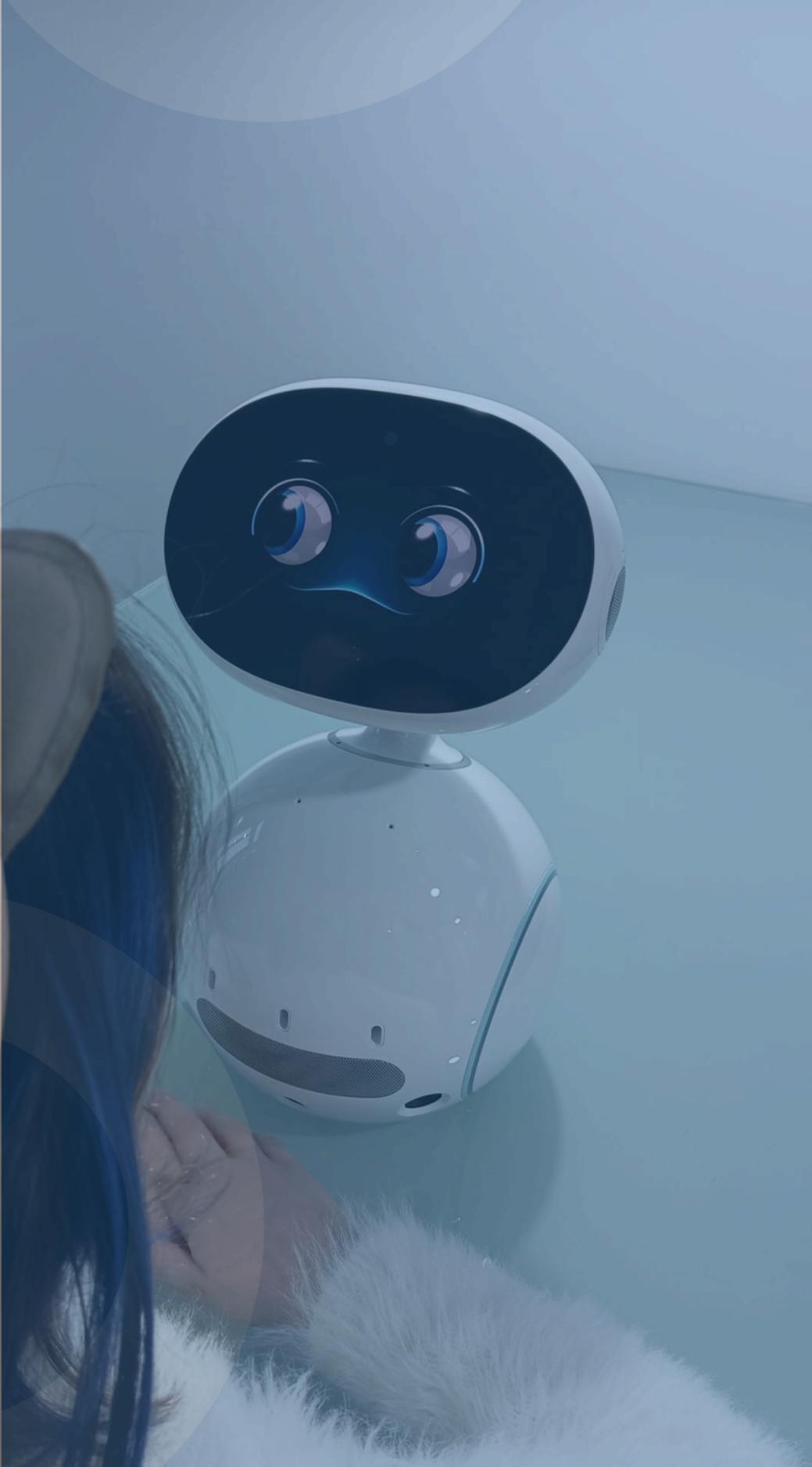
- Robot group demonstrated a significant improvement in prosocial behavior toward victims, with the girls' group showing significant improvement from Pre (4.14) to Post 1 (4.28), while the boys' group showed improvement from Pre (3.98) to Post 1 (4.21).
- Tablet and Control groups did not show significant changes.

In conclusion...

The Robot-based intervention was the most effective approach in promoting prosocial beliefs and attitudes, empathy, and prosocial behavior toward bullying victims.

In contrast, the Tablet-based intervention showed mixed or negative effects, while the Control group displayed no changes, reinforcing the impact of the ISR.

The enhanced motivation and willingness to interact fostered by the robot likely contribute to its higher effectiveness in promoting empathy and prosocial beliefs and attitudes, compared to the tablet-based intervention.





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