

# Mobile Eye-Tracking: a Novel Measure of Attention During Parent-Child Interaction Tasks

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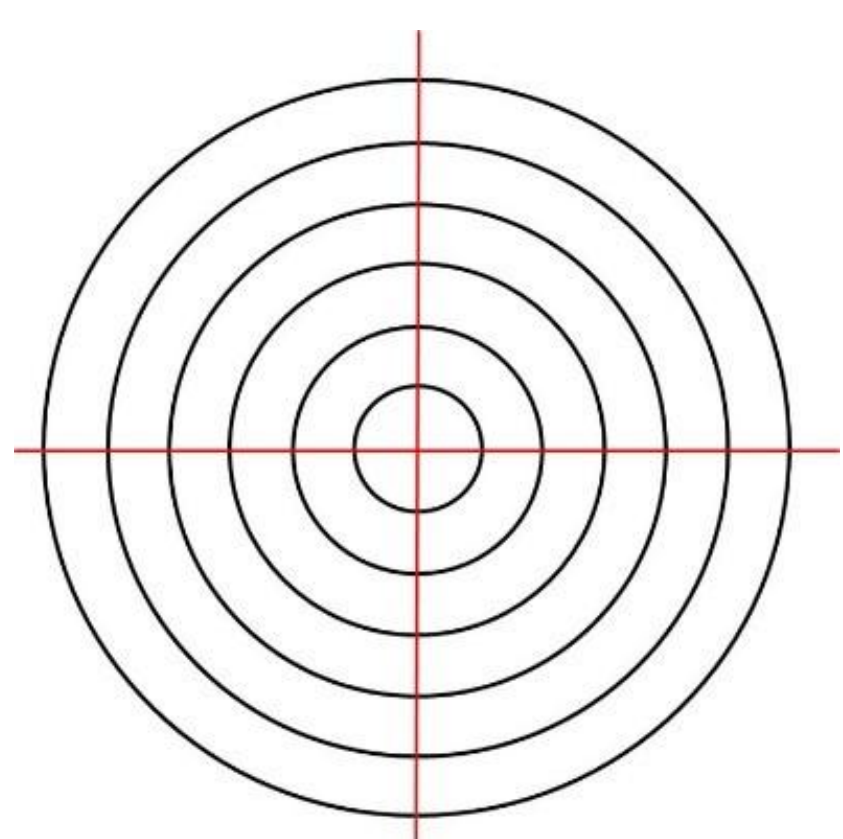
## Introduction

- **Promoting Empathy and Affiliation in Relationships (PEAR) Study:** a longitudinal study investigating children's socioemotional development (emotion, empathy, and prosociality) and parent-child relationships
- **Callous Unemotional (CU) Traits:** low empathy, guilt, and prosociality
  - Predicts a very high risk of childhood disruptive behavior disorders (DBD) and adverse adult outcomes such as violence, psychopathy, and crime
- **Tasks with multiple levels of analysis,** tracking attentional (i.e. stationary and mobile eye-tracking) and physiological (i.e. respiratory sinus arrhythmia) processes
  - **Example Tasks:** parent-report questionnaires and computer and observational tasks
- **Parent-Child Interaction Tasks**
  1. Reading a storybook: *I Walk with Vanessa: A Story About a Simple Act of Kindness*
  2. Completing a puzzle challenge
  3. Having discussions with each other (i.e. discuss what made you sad, discuss what made you happy, discuss why you love each other)
- **Mobile eye tracking (ET) is used for all 3 of the parent-child interaction tasks.**
  - Research with mobile ET has rarely been studied.
  - Enables researchers to obtain an accurate and reliable measure of visual attention with study participants' visual environments
- **Pupil Labs Invisible Glasses:**
  - Captures both eye gaze and their "visual world"



## Methods

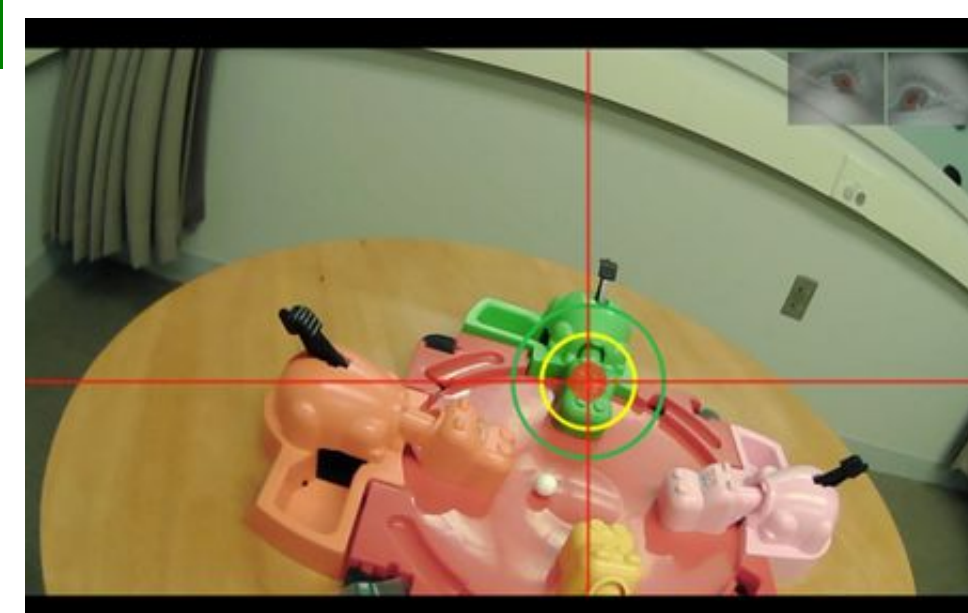
1. A thorough literature review was conducted using EBSCOHost and searches using the keywords "mobile eye tracking," "children," "Pupil Lab glasses," and "Pupil Player."
- Most papers were found through Koraly Pérez Edgar's Cognition, Affect, and Temperament Lab.<sup>2</sup>
2. Mobile eye-tracking data was recorded with the Pupil Labs Invisible Glasses through the Invisible Companion app.
  - Both the parent and child wore these glasses, and the phones (with the Invisible Companion app) were placed into fanny packs.
3. Before starting the official task, the researchers performed calibration and validation at the same time for both the parent and child by pointing the bullseye center and four points around the circle (at least 5 seconds per point).
  - The calibration procedure was repeated to perform validation.



- The lights were turned off and back on to help sync all the recordings.
- The Invisible Companion apps were checked again to ensure that the eye tracking video was still recordings for both the child and parent.
- Calibration took place again.

## Methods

4. Once the tasks with the mobile eye-tracking were completed, the recordings were loaded into Pupil Player.
  - The participants' gazes were found, and manual drift corrections were performed by lining up 3 gaze circles.
  - **Gaze Circle 1 (Red Dot), Gaze Circle 2 (Yellow Circle), Gaze Circle 3 (Green Circle)**
5. In order to do Manual Gaze Correction, open up the Manual Gaze Correction plugin in Pupil Player.
  - Pick a good frame where the child is looking at the target
  - Slide the bars to set the x\_offset and y\_offset numbers so that the red gaze circle is aligned with the target
  - Take note of the x\_offset and y\_offset numbers.



## Results

- Pupil Player mobile eye-tracking recordings were exported for observational coding.
  - Analyzed with these areas of interest (AOIs): parents' face and body, parent reference (i.e. point with the hand or finger), and looks to task materials (i.e. storybook characters and puzzle)
- The recordings were synced with the rest of the the room videos and physiological recordings from the visit.

### Comparing Mobile ET and Other ET Methodologies



Figure 1. Magnet Parent-Child Interaction Task (Room Videos)

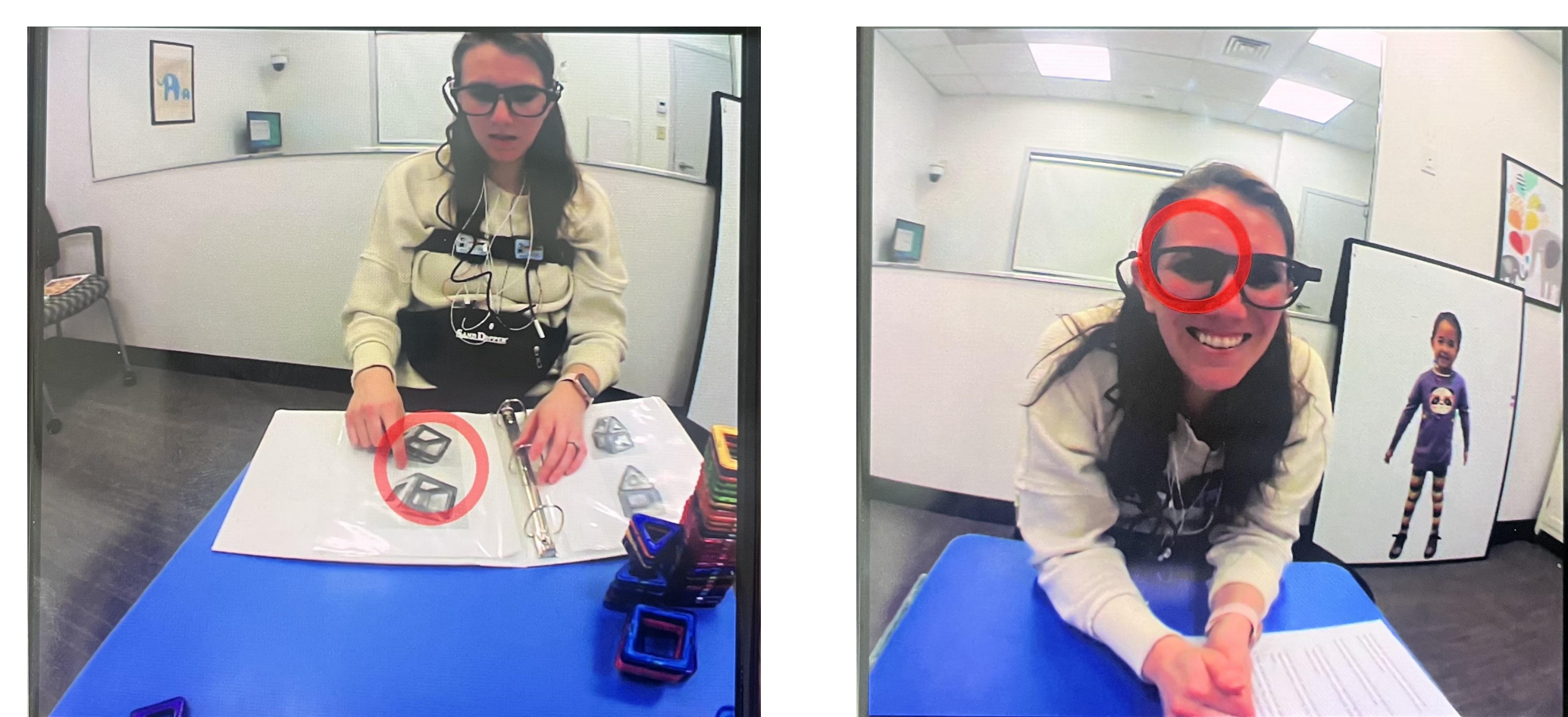


Figure 2. Magnet Parent-Child Interaction Task (Pupil Glasses)

**The room recordings do not give a clear picture of where the child is looking due to limited visual area. Mobile ET recordings can specifically show where and for how long the child is looking at a specific AOI.**

## Discussion/Conclusion

- **Main Motivation for Using Mobile ET:** Young children with CU traits perform worse at emotion recognition and identification.
  - Previous research has concluded that children with CU traits avoid eye contact, which would be seen within the mobile ET data recordings.<sup>1</sup>
  - Previous research concluded that when researchers suggested children to look at the eyes during an emotional recognition (i.e. fear) task, the performance was much better.
- **Mobile ET provides an additional measure of dyadic quality by allowing researchers to assess parent-child mutual eye-contact and joint attention.**
  - Recognizes if the child is looking at the right places for emotional recognition and identification.
  - Recognizes where the child is looking and why they are looking at that AOI if they are not looking into the right places
- **Investigate the relationship between the attentional processes and physio-biological data when children are recognizing emotion and participating in parent-child interaction tasks**
  - Studying this relationship is important because it answers where the children are not interested or if they are showing differences in emotional arousal.
  - Physio-biological data would show the emotions that the children are experiencing.

## Future Directions

1. Developing an observational coding protocol for the mobile eye-tracking recordings
  - Using coding schemes to code the mobile eye-tracking data
2. Using the protocol to code the mobile eye-tracking recordings from the PEAR Study pilot visits.

## References

1. Dadds, M. R.; Allen, J. L.; McGregor, K.; Woolgar, M.; Viding, E.; Scott, S. Callous-Unemotional Traits in Children and Mechanisms of Impaired Eye Contact during Expressions of Love: A Treatment Target? *J Child Psychol Psychiatr* **2014**, *55* (7), 771–780. <https://doi.org/10.1111/jcpp.12155>
2. MacNeill, L. A.; Fu, X.; Buss, K. A.; Pérez-Edgar, K. Do You See What I Mean?: Using Mobile Eye Tracking to Capture Parent-Child Dynamics in the Context of Anxiety Risk. *Dev Psychopathol* **2022**, *34* (3), 997–1012. <https://doi.org/10.1017/S0954579420001601>

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