

# Biofeedback Emotional Regulation Training for Pre-Schoolers



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## Introduction

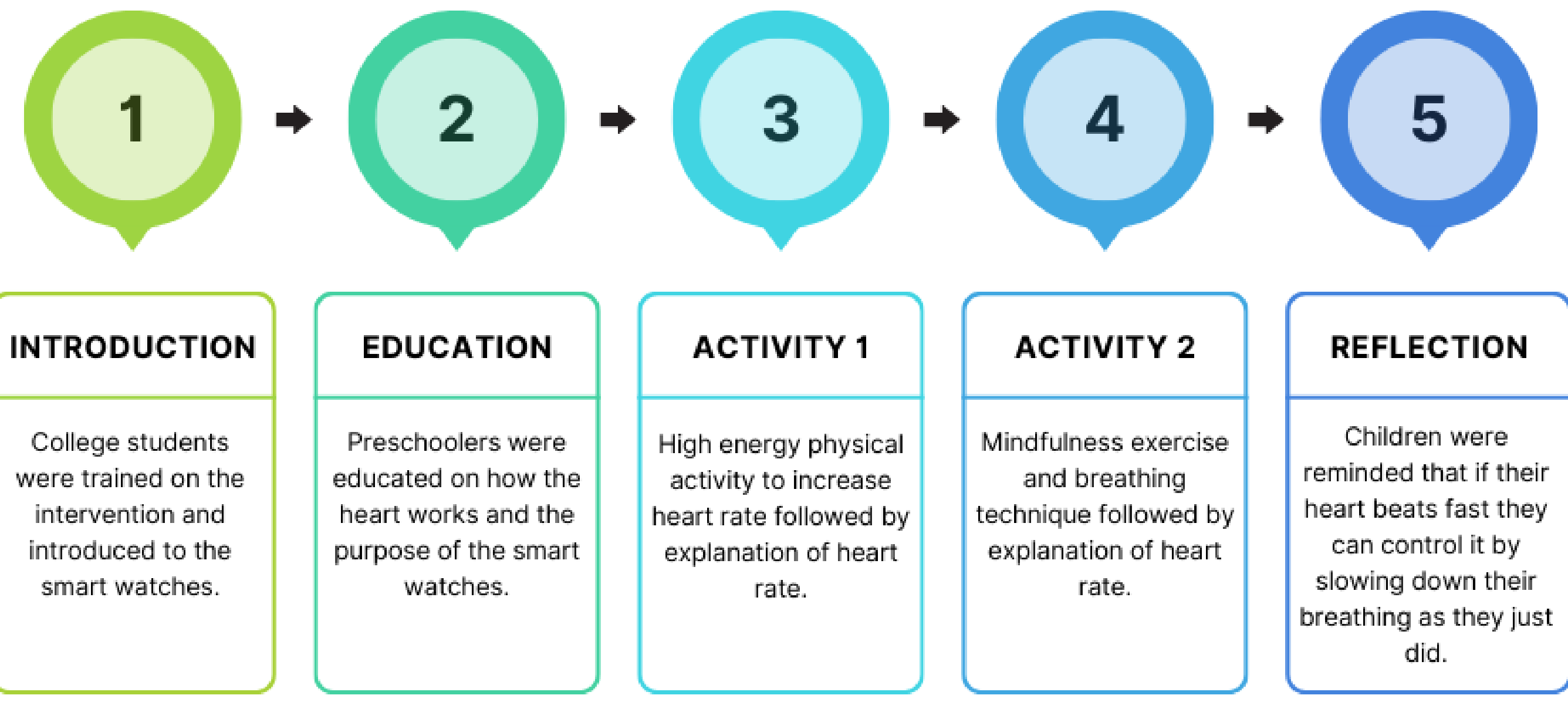
Biofeedback, as defined by Thabrew et al. (2018) is the use of equipment to measure physiologic processes such as heart rate. While biofeedback devices are becoming increasingly common, research around effective use of these devices is scarce, especially in the younger population. Some biofeedback studies have shown that biofeedback can be an effective complimentary treatment method for anxiety in children and adolescents (Thabrew et al. 2022; Alneyadi et al., 2021). Jean Piaget's cognitive development theory shows that children ages 4-5 are learning about the world through symbolic play (McLeod, 2023). Therefore, our Biofeedback Emotional Regulation Training (BERT) intervention designed for preschoolers will incorporate symbolic play along with guided imagery and diaphragmatic breathing exercises.

**Research Questions:** Does the biofeedback device act as a visual cue for children to understand how to raise and lower their heart rate? How effective is the BERT program in teaching children emotional regulation skills?

## Methods

College students implemented the BERT program with 11 preschool-aged students (4 years old) over a period of 10 to 12-weeks. Data was collected via (video conferencing) semi-structured interviews with the college students, preschool teachers, and parents.

Figure 1: Intervention Steps



This study had a total of 20 participants interviewed and 11 preschoolers observed. Figure 2 is a breakdown of all participants.

Figure 2: BERT Demographics

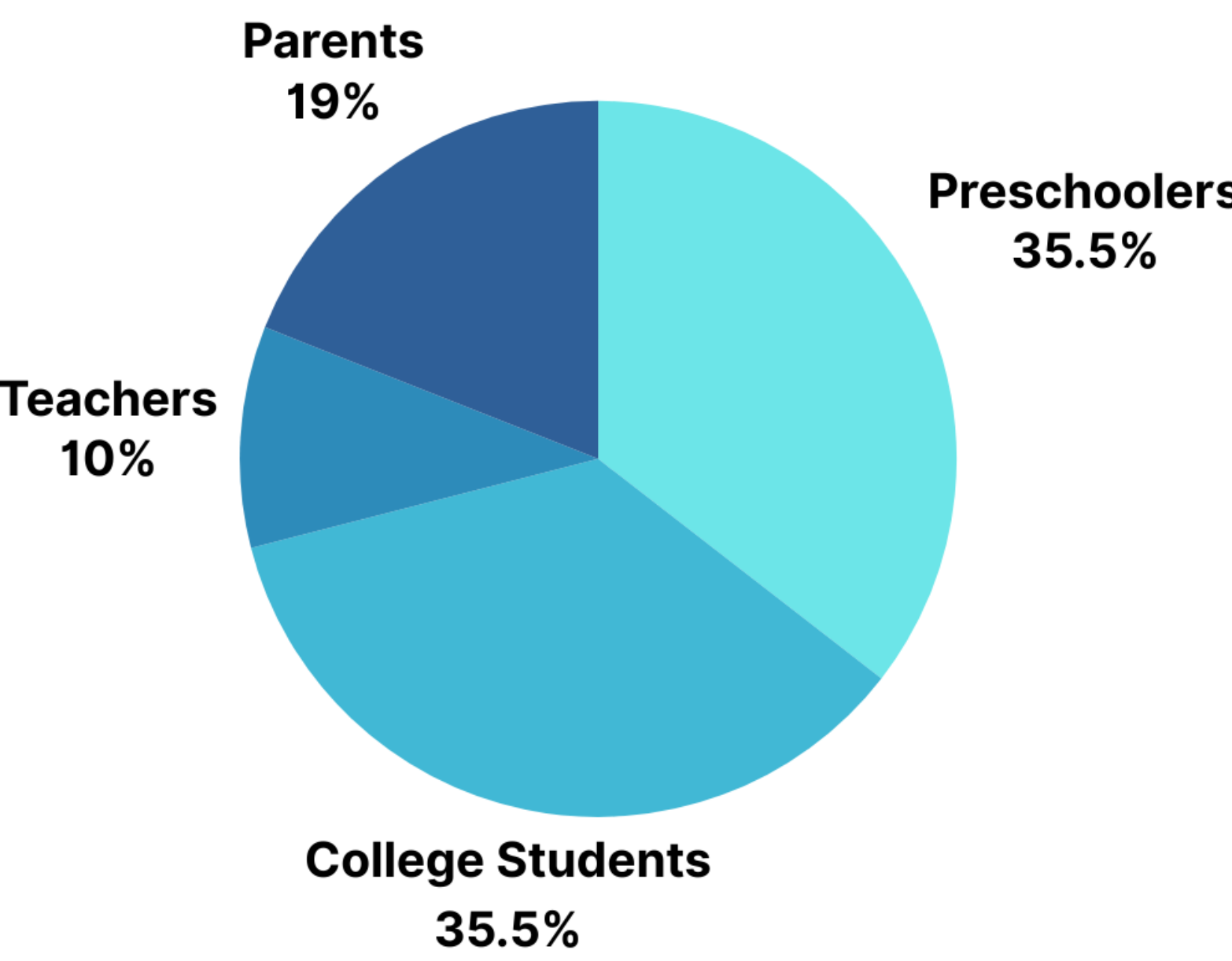
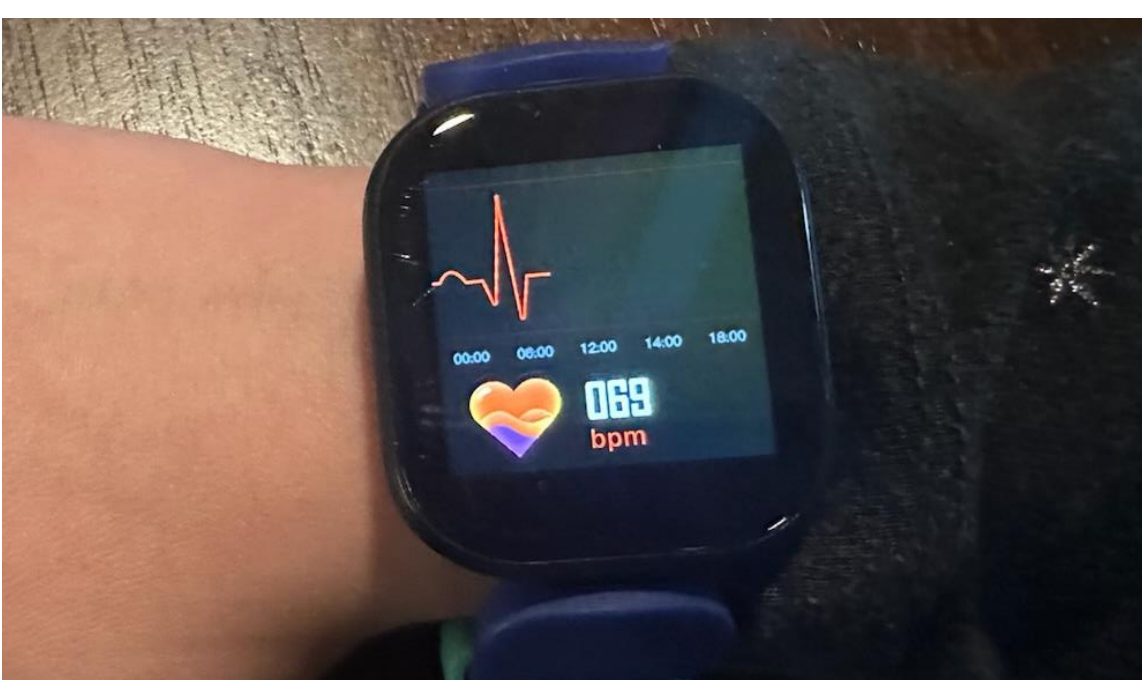


Figure 3: Biofeedback tool



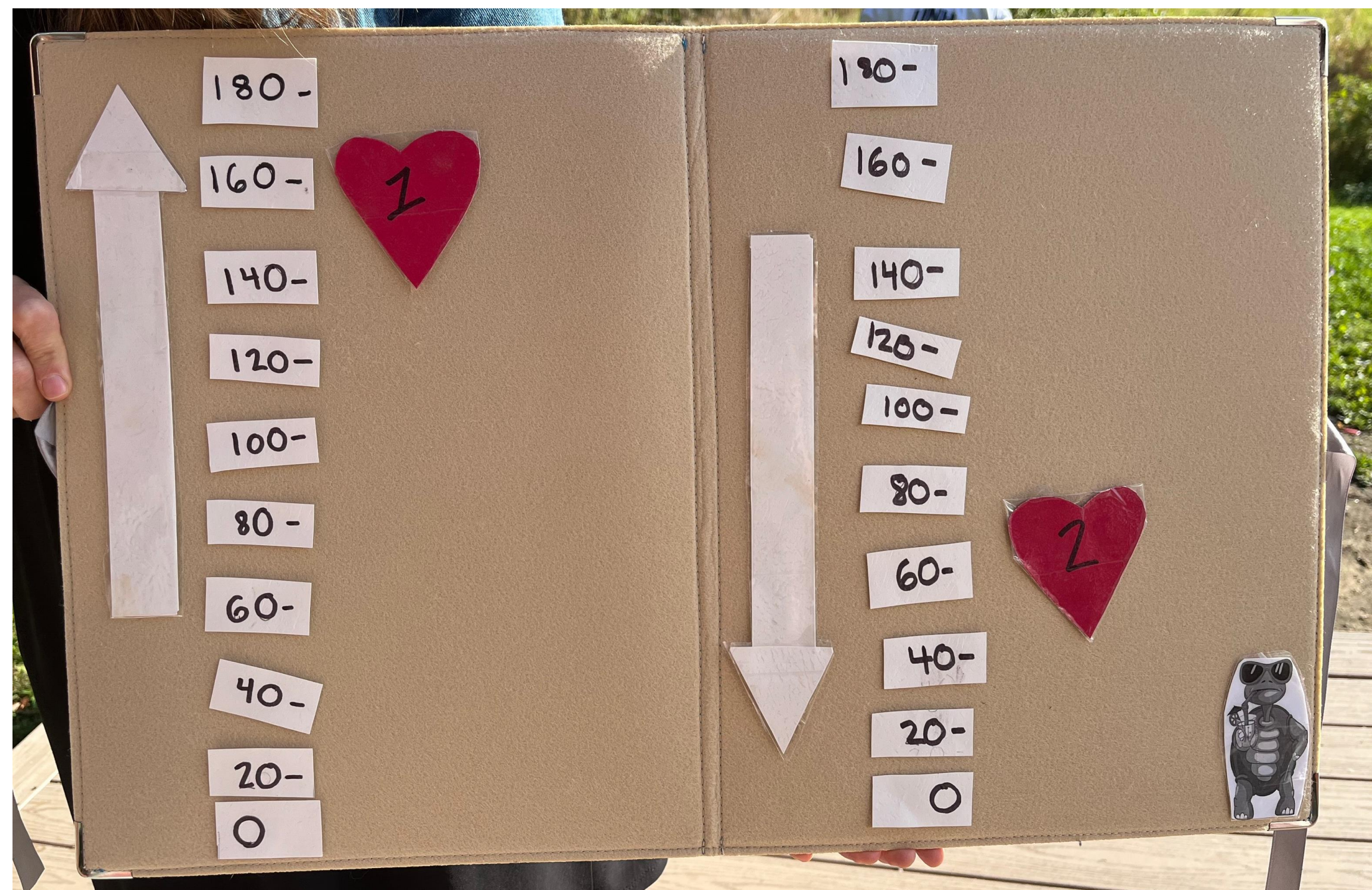
## Data Analysis

This study used a qualitative narrative inquiry with a thematic analysis for coding type (Creswell, 2014).

Figure 4: Data Collection Groups

	<b>Researcher Field Notes</b>	Contained the researchers' initial impressions and observations.
	<b>Student Interviews</b>	Shared their experience of engagement with the preschoolers during the program, and either positive or negative thoughts on the process.
	<b>Teacher Interviews</b>	Provided their expert observations of the program and device usage.
	<b>Parent Interviews</b>	Shared any stories or experiences related to BERT that was observed at home.

Figure 5: Felt Board Used for Step 5 of Intervention



## Limitations

- Convenience sample
- Narrow demographics: educated parents, largely white participants
- Curriculum includes emotional regulation strategies
- Inconsistent functioning of biofeedback devices
- Unpredictable/repeated activities

Future studies should expand the intervention to public schools and other more diverse populations and refine the curriculum. Alteration of the device is recommended such as utilizing an elastic band, a larger screen face, a cartoon that moves faster with heartbeat, and incorporating audio for those who are auditory learners. A follow up study would be necessary to evaluate the efficacy of this device.

## Personal Reflections

This project was a great introduction into the research process and changed my perspective on conducting research. Qualitative research in particular spoke to my interests in working directly with people and proved to be an enlightening and enjoyable experience. Being a member on this research project has enhanced my skills as a researcher and applying the skills into clinical practice. I've also had the wonderful opportunity to practice interdisciplinary work and build connections that will be undoubtedly beneficial as I begin my career.

## Results & Conclusions

The research team is currently in the data analysis process. We do not have final data, but preliminary data indicates the following themes emerging:

- **Implementing program into a public preschool**
- **Customize device for preschool children**
- **Importance of reinforcement of BERT concepts (e.g., handouts for home use)**

Analysis will continue into June of 2024, and we anticipate completing analysis and submitting for publication in the fall of 2024. We hope that our results will inform future uses of biofeedback devices in emotional regulation trainings for preschoolers. Study outcomes include information regarding the feasibility of using heart rate watches as a body cue with young children through the BERT intervention to help them learn skills to self-regulate their emotions. Outcomes from this study will help to develop promising practices for use of biofeedback devices with young children as well as the implementation of BERT. Development of a BERT training program for preschoolers may be disseminated.

"...As soon as we put those watches on, and they were actually able to see the heart icon and see their heart rate, they understood right away."  
 - UNH Student

"I did see, there were 2 children that I noticed that came out and they were using those calming techniques independently in the classroom."  
 - CSDC Teacher

Figure 6: Depiction of Step 4 (Mindfulness & Breathing Exercise)



## References

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- Creswell J. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Thousand Oaks, CA: Sage.
- McLeod, S. (2023) Jean Piaget's Stages of Cognitive Development & Theory. Simplypsychology.org Retrieved from [Jean Piaget's Theory and Stages of Cognitive Development - Simply Psychology](https://www.simplypsychology.org/Jean-Piaget.html).
- Thabrew, H., Ruppeltdt, P. & Sollers, J.J. Systematic Review of Biofeedback Interventions for Addressing Anxiety and Depression in Children and Adolescents with Long-Term Physical Conditions. *Appl Psychophysiol Biofeedback* 43, 179–192 (2018).

