

AIM AND OBJECTIVES

Determine the efficacy of a therapy dog intervention to promote children's emotional regulation thereby reducing math anxiety.

Objectives:

- [1] Identify children aged 4-9 who exhibit math anxiety
- [2] Identify whether therapy dog interventions in math education are effective in reducing math anxiety

Hypothesis: There will be a significant decrease in math anxiety following a therapy dog intervention

INTRODUCTION

Math anxiety (MA) encompasses negative feelings regarding math in academic situations and ordinary life (Ashcraft, 2002). MA leads to low achievement (Moore et al., 2015), including avoidance of careers or situations requiring mathematic skills. Cognitive consequences such as less cognitive reflection which leads to poorer decision making has been identified in math anxious individuals (Primi et al., 2018).

Up to 33% of students self-report experiencing MA (Vayssettes & Rech, 2015). Petronzi et al. (2019) validated the Children's Math Anxiety Scale, which demonstrated that math anxiety is experienced by children as young as four years old. The study of MA has shifted to targeting interventions in young children.

Recommendations are to increase reflective discussion and exploration-based games to provide access to learning (Sánchez-Pérez, 2021). Petronzi et al. (2022) demonstrated the use of a targeted storybook, which normalised math talk and encouraged self-regulation through problem-solving.

It has been argued that self-regulation should precede conceptual knowledge in supporting children with MA. Therapy dogs are well-documented to benefit children's literacy, emotional gains, and behavioural, social, and gross motor skills (Grové et al., 2021; Pettinato, 2018; Beetz, 2013).

To extend the research surrounding emotional regulation in maths, the current work investigates the efficacy of therapy dogs. We predict that there will be a significant decrease in math anxiety following therapy dog interventions.

METHOD

Design: Within-subjects design. Independent variable is the therapy dog intervention and dependent variable is math anxiety level.

Participants: Students aged 4-9. Those with diagnosed learning disabilities or receiving extra tuition were excluded from the study. Those who could not speak English were excluded from the study.

Materials: [1] trained working therapy dog, [2] Children's Math Anxiety Scale (CMAS-UK; Petronzi et al., 2019), [3] small bone-shaped treats, marbles, and bowls to be used to demonstrate mathematical concepts concretely, [4] dog themed workbook exercises developed by the research team.

Procedure: 15-minute therapy dog session conducted during math class once per week for two weeks. CMAS-UK scores were collected before and after the two-week intervention.

Data Analysis: Data met parametric assumptions. One-tailed student's t-test was used to compare means of math anxiety before and after the intervention.

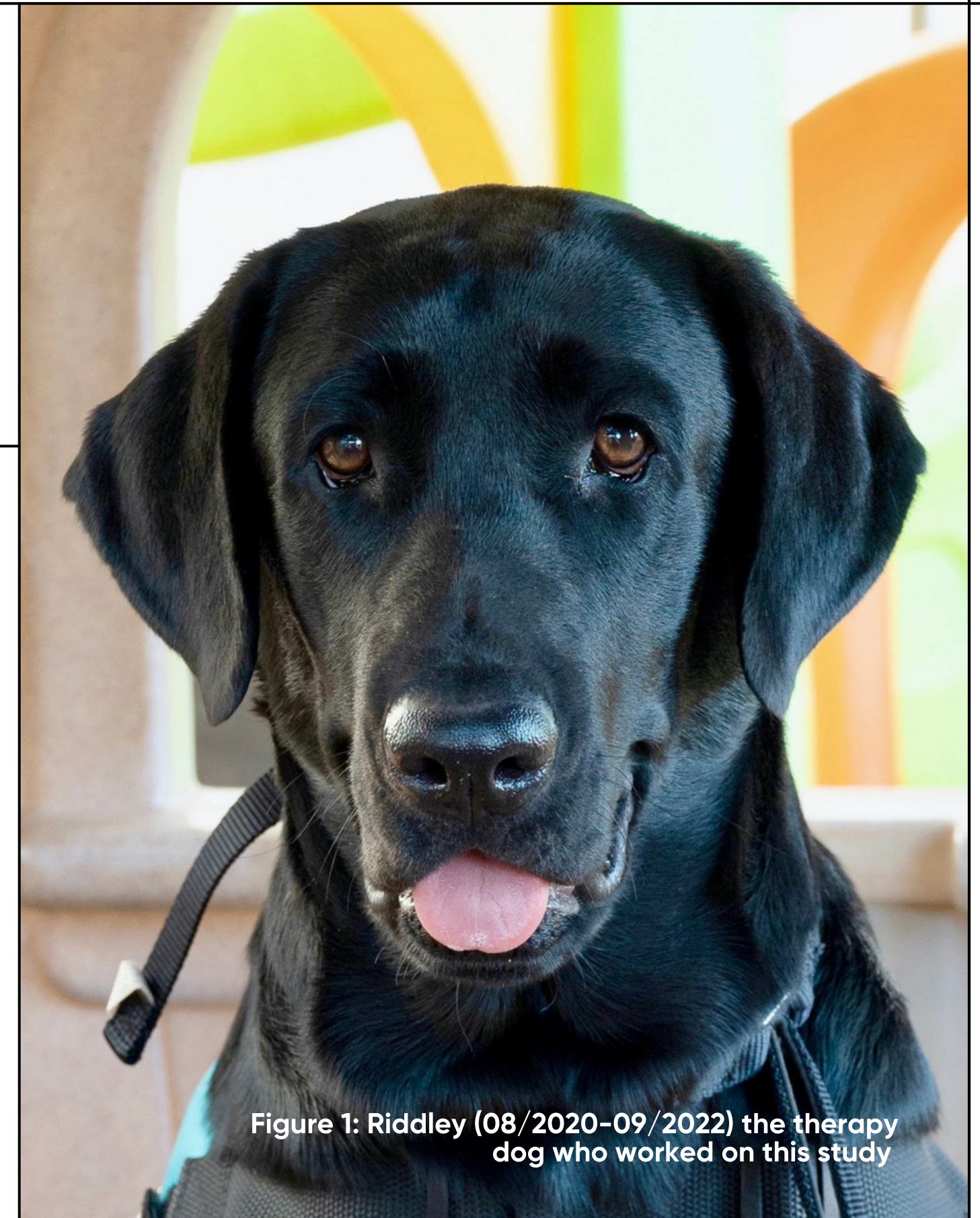


Figure 1: Riddley (08/2020-09/2022) the therapy dog who worked on this study

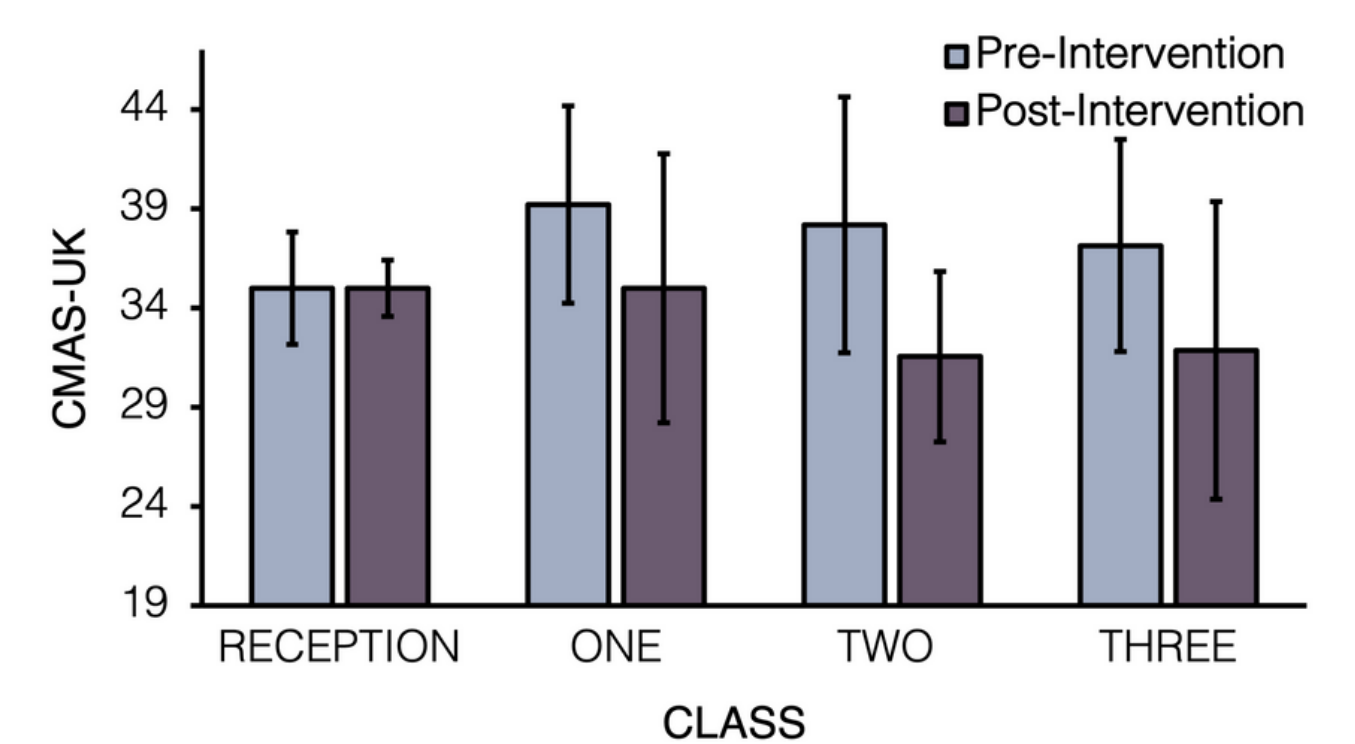


Figure 2: bar graph showing the means and standard deviations of CMAS-UK scores pre- and post-therapy dog intervention per class.

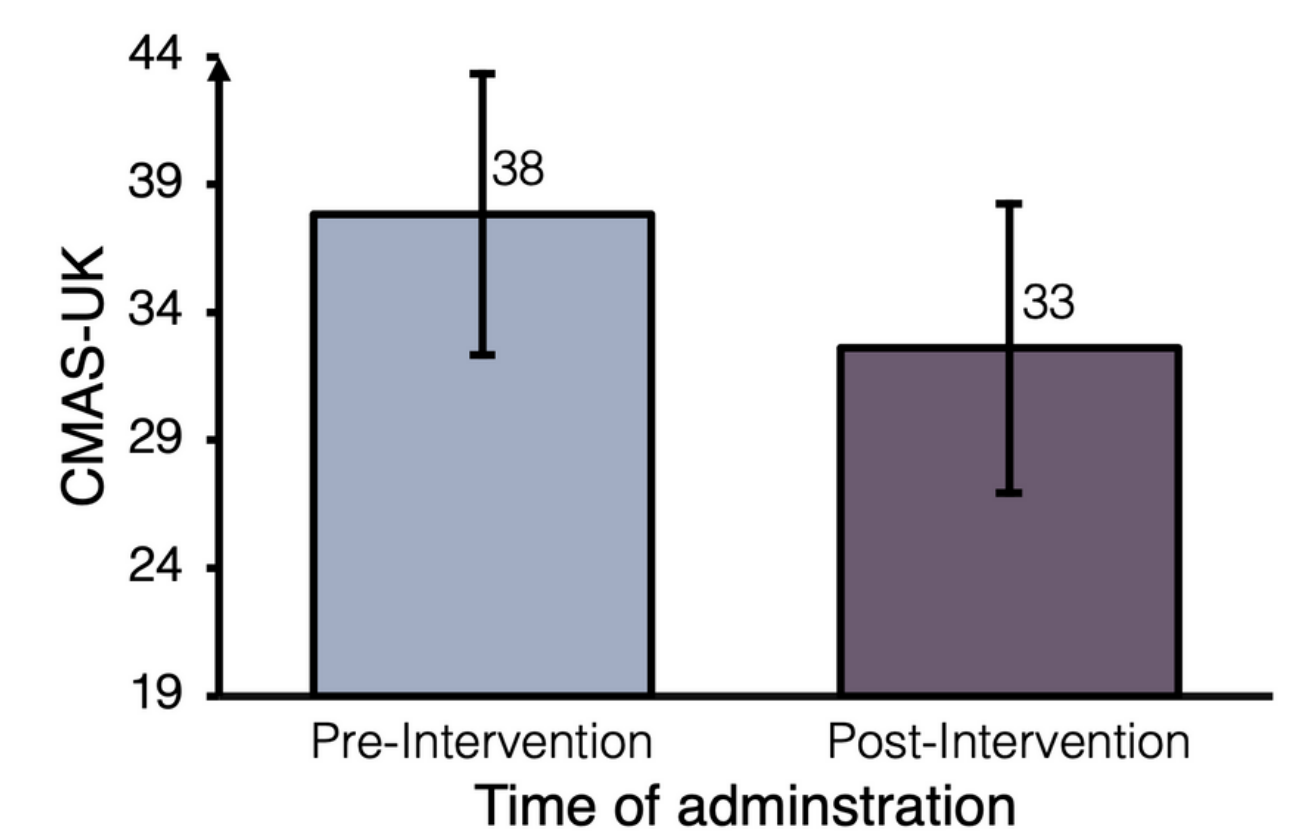


Figure 3: showing the means and standard deviations of CMAS-UK scores pre- and post- therapy dog intervention.



Figure 4: showing a therapy dog working with a girl in an academic setting

RESULTS

This study aimed to examine the impact of therapy dog interventions on math anxiety. A total of 53 children signed up for the study. Due to practical constraints, exclusion criteria, and removing outliers, 25 cases of data are included in these results.

Two schools were involved in the study. Participants included nine girls and 16 boys in classes reception (N=2), one (N=5), two (N=11), and three (N=7). Ages ranged from 5-9 ($M=6.76$, $SD=1.16$).

A within-subjects t-test indicated that maths anxiety was significantly higher pre- therapy dog intervention ($M=37.84$, $SD=5.49$) than post-therapy dog intervention ($M=32.60$, $SD=5.65$), $t(24)=5.23$, $p<.001$. These results reject the null hypothesis.

A univariate ANOVA analysis showed no significant interactions between year group and gender.

DISCUSSION & FUTURE DIRECTIONS

The results show a significant decrease of 5 points on the Children's Math Anxiety Scale (CMAS-UK) following in-classroom interventions with a therapy dog. These findings align with existing literature that therapy dogs promote emotional regulation, which reduces anxiety surrounding a particular subject.

The findings also confirm that young children experience math anxiety, suggesting slight variation between elementary school classes. This intervention did not interrupt the school day and could be integrated seamlessly within the classroom setting.

The therapy dog was used to promote a growth mindset (Dweck, 2016) by reducing self-comparisons to others, "Riddley works slowly

because she does her best work when she doesn't rush," encouraging a positive view of mistakes, "Mistakes are Riddley's superpower! She learns twice as much when fixing a mistake."

Using dog-themed games, the math was made concrete and fun (Sánchez-Pérez, 2021). Emotional regulation through self-reflection was promoted by encouraging the children to cuddle the dog when stressed, teaching them to [1] recognize stress in themselves and [2] regulate in response to stress (see also Petronzi et al., 2020).

Practical constraints limited the research to a simple design. Future directions are [1] to pursue the original factorial design with a larger sample size ($N>60$), and [2] to design a workbook that teachers or volunteers working with therapy dogs can integrate into the classroom setting.

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