The impact of humanoid robot presence on child experience in the emergency department waiting room: a prospective cohort study

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INTRODUCTION

Emergency department (ED) visits are stressful experiences for families, and wait times are long. Children place high importance on digital entertainment to improve their waiting room (WR) experience [2]. Utilizing digital technology reduces the pain and distress related to acutely painful procedures [3]. However, the impact of digital distraction tools on families' WR experiences is less understood. We deployed a humanoid robot to deliver a brief (~5 minute) psychology-based distraction intervention in the WR using song, dance and guided relaxation.

MATERIALS AND METHODS

Children aged 5-17 years and their caregivers visiting the Stollery Children's Hospital were recruited to this prospective cohort study from April to August 2024. Study tools included the Children's Fear Scale (CFS) as our primary outcome; Child Scary Scale (CSS; State Trait Anxiety Inventory for Children (STAI-CH); and State Trait Anxiety Inventory (STAI). Robot vs non-robot days were assigned via randomization schedule. Non-robot days involved the standard of care WR experience while robot days included standard of care plus presentation of the robot. Research assistants administered a 15-minute survey to both children and caregivers about their WR experience; on robot days, the same survey was administered AFTER the presentation with additional robot satisfaction questions. We compared child and caregiver scores between the robot and non-robot cohorts.

RESULTS AND DISCUSSION

A total of 203 children and 241 caregivers participated. Mean (SD) child age was 10.9 (4.0) years with 52.2% females. Caregiver mean (SD) age was 40.4 (7.4) years and 79.0% were mothers. The mean (SD) scores for CFS, CSS, STAI-CH, and STAI for the robot group were 1.2 (1.3), 2.1 (1.4), 40.8 (7.7), and 46.1 (10.0) respectively; non-robot scores were 0.9 (1.2), 2.2 (1.4), 42.2 (5.8), and 48.5 (11.3), respectively. Mean (SD) caregiver STAI scores were 42.9 (10.6) (robot) and 45.8 (11.8) (non-robot). The scores between robot and non-robot cohorts were not statistically significant for these measurements (See Table 1). Regarding satisfaction among children, 30.3% of the robot group were happy/very happy with their WR experience compared to 25.8% (non-robot). Similarly, 39.8% of caregivers in the robot cohort and 30.9% of the non-robot cohort were satisfied/highly satisfied with their WR experience Additionally, 72.5% of children and 72.7% of caregivers enjoyed/greatly enjoyed the robot, while 80.5% and 79.8% wanted it for future visits.

Fig 1 Robot and child.

CONCLUSIONS

A humanoid robot distraction intervention in the pediatric ED WR did not decrease child fear, pain, or anxiety. However, 80% of families wanted the robot present for future visits, and its presence was associated with higher child and caregiver satisfaction, suggesting that robot presence may enhance the WR experiences for families, despite the environment being inherently complex and stressful.

REFERENCES

[1] Ma K et al. *PloS ONE* **19**: 6, 2024.
[2] Gates et al. *Pediatrics* **145**: 2, 2020

Table 1: Child and caregiver self-reported anxiety and child fear

	Robot cohort	Non-robot cohort	*p-value*
Child Fear Scale [score range: 0-4]	1.2 ± 1.3	0.9 ± 1.2	0.15
Child Scary Scale [score range: 0-10]	2.1 ± 1.4	2.2 ± 1.4	0.33
Child STAI-CH [score range: 20-80]	40.8 ±7.7	42.2 ± 5.8	0.32
Child STAI [score range: 20-80]	46.1 ± 10.0	48.5 ± 11.3	0.34
Caregiver STAI [score range: 20-80]	42.9 ± 10.6	45.8 ± 11.8	0.07