



Pilot testing “Teach Ted”: A digital application for children undergoing blood tests and their parents

Christina Signorelli^{a,b,*}, Lauren Kelada^{a,b}, Claire E. Wakefield^{a,b}, Joseph E. Alchin^{a,b}, Irene Adam^a, Peta Hoffmann^c

^a Kids Cancer Centre, Sydney Children's Hospital, Randwick, NSW, Australia

^b School of Clinical Medicine, UNSW Medicine & Health, Discipline of Paediatrics, UNSW Sydney, NSW, Australia

^c Acute Allied Health Services, Canberra Hospital, ACT, Australia

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ABSTRACT

Objective: In this pilot study, we evaluated the acceptability and preliminary evidence of the impact of a new educational mobile application, “Teach Ted”, for children undergoing blood tests.

Methods: Parents of children (4–10 years) completed questionnaires on anxiety and pain before their child had a blood test, and after using Teach Ted and receiving their blood test. Health professionals at each patient's blood test (e.g. technician/nurse) completed questionnaires on patient outcomes and procedure-related outcomes (e.g. time taken).

Results: Nine parents and eight health professionals participated. All but one parent ($n = 8/9$) reported Teach Ted was useful. Seventy-eight percent ($n = 7/9$) reported they would use Teach Ted again. All health professionals who completed the acceptability measure ($n = 3/3$) strongly agreed that Teach Ted was relevant/helpful. Many parents perceived Teach Ted helped reduce their/child's anxiety ($n = 3/5$, 60% and $n = 4/6$, 67% respectively), although child's pain and child's/parent's anxiety remained similar before and after using Teach Ted (all $p > 0.05$). The average blood test duration was 7.6 min (range ≤ 1 to 22), which health professionals ($n = 3/3$) reported was not elongated by offering Teach Ted.

Conclusions: Participants reported that Teach Ted was acceptable. Further evaluation of Teach Ted's impact on patient's outcomes are needed.

Innovation: Teach Ted is an innovative mobile application with potential to educate young children about their upcoming procedure and mitigate negative outcomes.

1. Introduction

Medical procedures are a common and often unavoidable source of pain or distress for young children. In the hospital setting, children can experience procedure-related pain, which can be associated with negative emotional and psychological implications. [1] In addition to the experienced pain and anxiety by children and their families, there can also be a burden on the healthcare system. For example, anxious children may be less compliant or require longer procedures [2], potentially resulting in increased staff pressure and reduced patient satisfaction. Child Life Therapy, or play therapy, involves procedural education, re-focusing strategies, and medical, therapeutic, or developmental play

[3,4], to develop children's coping skills to manage procedure-related pain and distress [5]. Such preparation helps children and families by building their procedure-related understanding and familiarity, and normalising the clinical environment, providing a sense of control and empowerment [6].

However, Child Life Therapy may not be available or readily accessible in resource-limited healthcare settings. Current interventions which use play-based principals to boost coping skills in children – such as the Comfort, Ask, Relax, Distract (CARD) system or CliniPup – tend to target older children, [7,8]. There is little patient education designed for young children, particularly pre-readers, to educate them about medical procedures in hospital, or uptake in very young children is low, [9]

Abbreviations: FAS, Facial Affective Scale; VAS-A, Visual Analogue Scale for Anxiety; STAI-Y6, State-Trait Anxiety Inventory Form Y; FLACC, Faces Legs Activity Cry and Consolability Scale; SD, Standard Deviation.

* Corresponding author at: Kids Cancer Centre, Level 1 South, Sydney Children's Hospital, High St, Randwick, NSW 2031, Sydney, Australia.

E-mail address: c.signorelli@unsw.edu.au (C. Signorelli).

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despite younger children reporting greater procedure-related distress [10,11], and exhibiting more behavioural distress during invasive medical procedures than older children [12,13]. Whilst passive informational resources have been evaluated, [14] interactive learning through play is especially critical for younger children, to help them cope better [15,16]. For medical procedures, this may result in less discomfort for children, and their carers, and better outcomes.

Teach Ted (<https://www.teachteted.com.au/>) is a digital resource (i.e. for mobile phones, tablets or other devices) intended for use by children undergoing routine medical procedures and their families, and available regardless of where they live or who is delivering their medical care. Teach Ted resources incorporate Child Life Therapy and early childhood learning principles. Based on a 'learning through play' approach, Teach Ted lets younger children, and older children with learning or language challenges, prepare for upcoming hospital admissions and other medical procedures by playing a fun, interactive game. At present, the acceptability and the clinical effectiveness of Teach Ted has not been determined. This study aimed to assess the acceptability of Teach Ted's 'Ted gets a blood test' resource, developed in consultation with the Child Life Therapists from our Children's Hospital Network, among parents of young patients, and their health professionals, and to gather preliminary evidence of the effectiveness of Teach Ted on children's and parents' procedure-related anxiety, among other outcomes. In particular, we aimed to:

1. Understand the acceptability of 'Ted gets a blood test' in parents of children undergoing a blood test, and health professionals performing the blood test procedure (e.g. blood collector, nurse).
2. Evaluate early evidence of the impact of using "Teach Ted" prior to medical procedures on patients' anxiety levels and procedure times.

2. Methods

2.1. Teach Ted

This pre-post pilot study focused on evaluating the first Teach Ted episode 'Ted gets a blood test'. In this episode, children help the main character, Ted, through a number of scenarios which explain the blood test procedure step-by-step. The narrators, Ted and Lambie (Ted's best friend playing the role of carer) tell the story along the way, guiding children and their parent through the blood test procedure and what they can expect. Children were encouraged to engage with the app themselves and with the assistance of their parent. Teach Ted includes tips for families and carers and links to reliable, current education material. At the end of the episode, the user completes a simple quiz to reinforce their learning and, upon successful completion, they receive an achievement certificate which can be printed and taken with them. The user also receives a checklist to take with them covering each major step so they feel a level of control over the process. On each screen, there is a link to additional information for parents which includes common areas of concern and tips for further discussing blood tests with their children.

2.2. Participants

Parents were eligible if they had a child aged between 4 and 10 years of age who was due to receive a blood test at two participating children's hospitals; and they were able to read and speak sufficient English to use Teach Ted and complete the questionnaires. Parents were considered ineligible if they had a cognitive impairment limiting their capacity to answer the questionnaires reliably, or if their child had a terminal illness or may die imminently. The health professionals who administered the blood tests (e.g. nurses, blood collectors) were also invited to complete questionnaires.

2.3. Recruitment

We recruited participants on-and-off between October 2020 and June 2022, with multiple periods of restricted recruitment due to COVID-19 related government mandated lockdowns. A researcher invited eligible patients undergoing a blood test at one of two hospitals to participate in the study in person in the pathology waiting rooms. Information about participating in the study was provided to children under 8 via their parent, or if over 8 children were given their own information sheet. All parents provided verbal and written consent, for them and their child to participate. After giving their consent, (for parents) or verbal assent (for children) we provided participants with instructions for using the Teach Ted application on a tablet given by the study team. Children and parents went through the Teach Ted application, and then completed the first questionnaire whilst waiting for their blood test and numbing cream to take effect (~20–30 min). After their child's blood test, parents completed another questionnaire. During or immediately after performing the blood test, the attending health professional completed an observational questionnaire of the patient's behaviours during and after the blood test, as well as a separate evaluation of Teach Ted.

2.4. Ethical considerations

This study was approved by the hospital's institutional ethics review board. Participation was voluntary as reiterated through verbal and written communication (i.e. information sheets). No compensation was provided for study participation. Standard risk management practices of the participating department were maintained to ensure child and parent safety during the study. That is, for any participant with a known history of anxiety, clinical staff recommend Child Life Therapy services who assisted the child prior to their procedure, and have at least two medical staff present if needed during the procedure as a part of standard practice. Participant confidentiality was maintained and limited demographic details were collected to maximise participant privacy (see 2.4 and Table 1).

2.5. Outcomes and measures (listed in Table 1)

Questionnaires included questions about participants' demographic (e.g. child/parent sex) and clinical information (e.g. reason for blood test), in addition to the following primary and secondary outcome measures.

We measured acceptability using purpose-designed measures for parents (11-items, e.g. usefulness, perceived impact) and health professionals (3-items, e.g. relevance). To measure children's self-reported anxiety levels we used a Facial Affective Scale (FAS) [17]. Parents and health professionals also reported how anxious they believed the child was during the procedure using the Visual Analogue Scale for Anxiety (VAS-A) [18]. To measure parents' anxiety, we used the short-form 6-item State-Trait Anxiety Inventory Form Y (STAI-Y6) [19]. We measured children's self-reported pain using the Wong-Baker Faces picture scale [20]. We also invited parents and health professionals to report the observed level of pain of the child during the blood test using the pain VAS and the Faces Legs Activity Cry and Consolability Scale (FLACC; health professionals only) [21]. To measure the potential impact on procedural outcomes, health professionals reported procedure time, accuracy (e.g. completed fully/partially), and the number of attempts/health professionals required to complete the blood test.

2.6. Data analysis

We conducted quantitative data analysis using IBM SPSS v27.0 [22]. We used descriptive statistics (e.g. proportions, means, SDs where appropriate) to summarise the demographic and clinical characteristics of the sample, or key findings. We compared continuous outcomes using

Table 1
Outcomes assessed and measures used in the questionnaires.

Domain assessed	Description of measures included
Participants' demographic and clinical information	<i>Demographic information</i> <ul style="list-style-type: none">- Child sex- Child age- Parent sex <i>Clinical information</i> <ul style="list-style-type: none">- Reason for blood test- History of prior blood tests- Other resources used by child and parent whilst waiting for blood test (e.g. iPad)
Acceptability of Teach Ted	<i>Parents' acceptability</i> <ul style="list-style-type: none">- A purpose-designed measure including 11 items evaluating the usefulness, convenience, usability, comprehension, satisfaction with the information, and perceived impact in terms of preparing them or their child for the procedure, and reducing their or their child's anxiety, rated on a scale of 1="Strongly disagree" to 5="strongly agree"- Two open ended questions on what participants liked and disliked about using Teach Ted- An open-ended question on participants' suggested improvements for Teach Ted- An item on whether parents would use Teach Ted again, rated on a scale of 1 = "Not at all likely" to 5 = "Very likely"- The perceived length of Teach Ted, including the response options 1 = "Too short", 2 = "Just right", or 3 = "Too long" <i>Health professionals' acceptability</i> <ul style="list-style-type: none">- A purpose-designed measure asking about their perceived helpfulness and relevance of Teach Ted for children and their parents preparing for medical procedures, rated on a scale of 1="Strongly disagree" to 5="strongly agree".- A single question on how likely health professionals would be to use Teach Ted again or to recommend it to other health professionals (on a scale of 1 = "Not at all likely" to 5 = "Very likely")- Any adverse events relating to the medical procedure and/or use of Teach Ted
Child's anxiety	<i>Child's self-reported anxiety</i> <ul style="list-style-type: none">- To measure children's self-reported anxiety levels we used a Facial Affective Scale (FAS), [17] which measures pain unpleasantness using a facial pictorial scale comprised of nine faces. Parents helped children to indicate the face which best represented their emotional experience of pain ranging from "happiest feeling possible" to "saddest feeling possible".- Higher ratings indicated higher anxiety. <i>Proxy reported anxiety</i> <ul style="list-style-type: none">- Parents and health professionals also reported how anxious they believed the child was during the procedure using the Visual Analogue Scale for Anxiety (VAS-A) from 1 to 10. [18]- Higher ratings indicated higher anxiety.

Table 1 (continued)

Domain assessed	Description of measures included
Parents' anxiety	<i>Parents' self-reported anxiety</i> <ul style="list-style-type: none">- To measure parents' anxiety, we used the short-form 6-item State-Trait Anxiety Inventory Form Y (STAI-Y6), [19] which is a briefer version of the original Spielberger State Anxiety Scale.- Parents were asked to indicate on a 4-point scale, ranging from 1 "not at all" to 4 "very much", how much anxiety they were feeling.- For analysis, we reversed positive items for scoring, creating a total sum of a possible 24, with higher scores indicating higher anxiety.
Child's pain	<i>Child's self-reported pain</i> <ul style="list-style-type: none">- We measured child pain using the Wong-Baker Faces picture scale, [20] a validated measure for children over 3 years of age to self-report their pain experiences. <i>Proxy reported pain</i> <ul style="list-style-type: none">- We invited parents and health professionals to report the observed level of pain of the child during the blood test using the pain VAS from 1 to 10.- Health professionals also used the Faces Legs Activity Cry and Consolability Scale (FLACC), [21] to report the child's pain during the procedure as rated each of the 5-items from 0 (e.g. no smile, relaxed position, no crying) to 2 (e.g. frequent quivering chin, kicking legs, crying).- Higher VAS or FLACC scores respectively indicated greater pain, or more severe discomfort/pain.
Procedural outcomes	<i>Procedural factors reported by health professionals</i> <ul style="list-style-type: none">- Time taken to perform the procedure- Accuracy of the blood test (e.g. completed in full or partially)- The number of attempts required to successfully complete the blood test.- The number of health professionals required to successfully complete the blood test.

paired sample *t*-tests. We considered a significance level of 5% for all comparisons (two-sided). The primary purpose of these comparisons were descriptive rather than hypothesis testing to provide preliminary information about potential efficacy, and all differences are presented with appropriate confidence intervals, where possible.

3. Results

3.1. Participant characteristics

3.1.1. Patients and parents

Twelve parents of children having blood tests opted to participate in the study and completed baseline questionnaires. Of these, nine parents completed questionnaires after their child's blood test and were included in the analysis. Participating children undergoing blood tests were on average 5.9 years old, ranging between 4 and 10 years. Seventy-eight percent of children were male, and mostly accompanied by their mothers (78%). Participating parents were on average 38.6 years old (range = 32–48 years). Thirty-three percent of the families lived in rural or remote areas and had travelled to one of the participating hospitals for their child's medical care. All but one parent indicated that this was not their child's first time having a blood test. The most commonly

reported reasons for having the blood test were routine check-ups ($n = 3$, 67%), or related to cancer care ($n = 2$, 22%).

Besides Teach Ted, parents noted several other (and sometimes multiple) resources that their child used whilst waiting for their blood test, including playing with teddies/toys ($n = 3$), playing on the child's own iPad ($n = 2$), reading ($n = 1$), providing treats before/after ($n = 1$), or speaking about the procedure ($n = 1$). One family had also used Child Life Therapy services to prepare for the blood test.

3.1.2. Health professionals

Eight unique health professional administered blood tests for the nine participating patients, including phlebotomists ($n = 4$) or pathology collectors ($n = 3$), and a registered nurse ($n = 1$). Of these, three health professionals completed questionnaires after the procedure to evaluate Teach Ted.

3.2. Acceptability of Teach Ted

3.2.1. Parents' acceptability

All but one parent reported that they found Teach Ted useful and 78% of parents ($n = 7/9$) said it was likely that they would use Teach Ted again. One parent reported that they found it inconvenient, or hard to understand and to use (Fig. 1). Most parents (75%, $n = 6/8$) indicated that they were satisfied with the amount and quality of information that Teach Ted contained. Qualitatively, parents endorsed Teach Ted, praising its general appearance, content, and usefulness, especially as a tool to help prepare for, and distract their child from, the upcoming procedure. One parent of a child aged 4 years reported that "Teach Ted had clear graphics, appealing characters and narrative", whilst a parent of a child aged 5 years reported they "liked the interactive video". Another parent of a child aged 5 years reported that Teach Ted "explained the process and distracted [the child] at the same time". All parents reported that the length of Teach Ted was "just right".

Some parents also proposed improvements to Teach Ted. For example, one parent suggested that the content was better suited to older children than their child as "It has a lot of information for a 5 year old". Another parent suggested improving its accessibility by "[making it] available on YouTube so you can prepare at home" rather than on a

provided device in the waiting room prior to their appointment.

3.2.2. Health professionals' acceptability

Of the three health professionals who completed evaluations of Teach Ted, all strongly agreed that Teach Ted was relevant for children and their parents preparing for medical procedures. All health professionals also strongly agreed that Teach Ted was helpful for children and parents to prepare for the blood test. All health professionals indicated that they would be very likely to use Teach Ted with their patients in the future, and would recommend it to other health professionals. No adverse events were reported by health professionals among patients who had used Teach Ted.

3.3. Early evidence of the impact of Teach Ted

Most parents perceived that overall Teach Ted helped their child with their blood test (86% $n = 6/7$), especially with preparing their child for the blood test (80%, $n = 4/5$). Many parents also reported perceiving that Teach Ted reduced their child's anxiety (67%, $n = 4/6$), or their anxiety (60%, $n = 3/5$) about the blood test (Fig. 1). One parent of a child aged 4 years reported in the survey that "Teach Ted was helpful and informative for myself as a parent. I believe it would be very helpful and calming for kids too".

3.3.1. Child's pain

Before their blood test or using Teach Ted, children anticipated some pain on the Wong-Baker Faces pain scale with an average rating of 3.7 out of a possible 6 (SD = 2.1; range = 1–6, see Table 2). We did not observe any difference in the patient's pain as rated after using Teach Ted and immediately following their blood test, with an average score of 3.4 (SD = 2.1; range = 1–6, $p = 0.808$).

Using the VAS, parents reported that they anticipated their child to experience little pain during the blood test (mean = 36.5; SD = 21.3; range = 9–92), which appeared to be similar to pain reported during the blood test (mean = 41.7; SD = 27.3; range = 10–81, $p = 0.817$).

Health professionals rated children's pain whilst undergoing the blood test on average as 3.5 on the VAS (SD = 2.6; range = 0–8). On the FLACC measure health professionals rated children's pain in the Teach

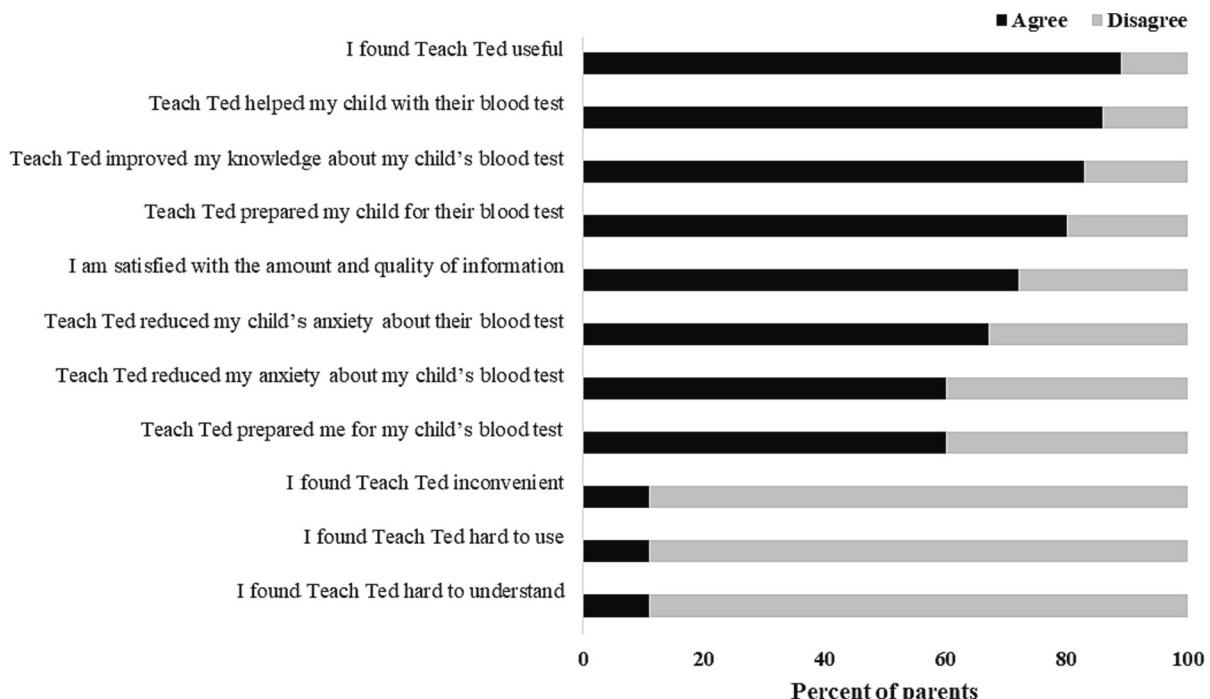


Fig. 1. Parent-reported acceptability and perceived impact of Teach Ted.

Table 2
Participant reported anxiety and outcome pre- and post-intervention.

Outcome measure		T1*	T2	p-value
Anxiety	Child self-report (FAS)			
	Mean	4.9 / 9	4.3 / 9	0.508
	SD	2.6	3.4	
	Range	1–9	1–9	
	Parent report of child (VAS-A)			
	Mean	67.5	64.7	0.481
	SD	21.7	25.9	
	Range	30–92	22–100	
	Parent self-report(STAI-Y6)			
	Mean	15.5 / 24	14.8 / 24	
Pain	SD	3.1	5.5	
	Range	13–23	7–23	
	Health professional report of child (VAS-A)			
	Mean		4.9	
	SD		3.1	
	Range		1–10	
	Child self-report (Wong-Baker Faces Scale)			0.808
	Mean	3.7 / 6	3.4 / 6	
	SD	2.1	2.1	
	Range	1–6	1–6	
	Parent report of child (VAS)			
	Mean	36.5	41.7	0.817
	SD	21.3	27.3	
	Range	9–92	10–81	
	Health professional report of child (VAS)			
	Mean		3.5	
	SD		2.6	
	Range		0–8	
	Health professional report of child (FLACC)			
	Mean		4.2/10	
	SD		3.4	
	Range		1–10	

Abbreviations: FAS: Facial Affective Scale, VAS-A: Visual Analogue Scale for Anxiety, STAI-Y6: State-Trait Anxiety Inventory Form Y, VAS: Visual Analogue Scale, FLACC: Faces Legs Activity Cry and Consolability Scale.

* T1 = post-use of Teach Ted, T2 = post-medical procedure.

Ted group an average of 4.2 (out of a maximum of 10), which reflects moderate pain (SD = 3.4; range = 1–10).

3.3.2. Child's anxiety

Before their blood test or using Teach Ted, children indicated a moderate amount of anxiety with an average score of 4.9 on the Faces Anxiety Scale out of a possible 9 (SD = 2.6; range = 1–9, see Table 2). We did not observe any difference in the amount of anxiety reported before their blood test when compared to patient's anxiety reported after using Teach Ted and immediately following their blood test, with an average score of 4.3 (SD = 3.4; range = 1–9, $p = 0.508$).

Using the VAS, parents reported that their child was moderately anxious in anticipation of their blood test (mean = 67.5; SD = 21.7; range = 30–92), which appeared to be similar to anxiety reported during the blood test (mean = 64.7; SD = 25.9; range = 22–100, $p = 0.481$). Health professionals rated children's anxiety whilst undergoing the blood test on average as 4.9 on the VAS (SD = 3.1; range = 1–10).

3.3.3. Parents' anxiety

Before their child's blood test, or using Teach Ted, parents indicated an average anxiety score of 15.5 (out of a possible score of 24, SD = 3.1; range 13–23). We did not observe a significant difference in parents' anxiety after they had used Teach Ted and immediately following their

child's blood test, with an average score of 14.8 (SD = 5.5; range = 7–23, $p = 0.623$).

3.3.4. Procedural outcomes

Health professionals reported that all blood tests were completed successfully in full, and on the first attempt. The duration of the blood tests was on average 7.6 min (SD = 6.1; range ≤1 to 22 min). No health professional reported that offering Teach Ted made the procedure take any longer to complete than if patients had not used Teach Ted. In two of the nine tests (22%), two health professionals were required to carry out the procedure.

4. Discussion and conclusion

4.1. Discussion

This pilot study suggests that Teach Ted is acceptable to parents of children undergoing blood tests, and to health professionals. Parents suggested some improvements, including revising the content and amount of information for younger children, and making the application more accessible from outside the hospital setting. While further data are required to evaluate whether Teach Ted is effective on the studied outcomes, early evidence suggests that Teach Ted does not appear to negatively impact patients' or parents' outcomes, or procedural outcomes and no associated adverse events or outcomes were reported.

Despite the encouraging acceptability data, we did not observe any significant differences in participating children's pain, or children's/parents' anxiety related to the blood test, after using Teach Ted. This may be due in part to the relatively short duration between using Teach Ted and receiving the blood test, as highlighted by one of the participating parents. Although children's self-reported and proxy reported pain and anxiety ratings appeared similar before/during the blood test, without a comparison or control group we could not determine whether or not Teach Ted would have been exclusively responsible for any improvements observed. Given the potential for preparatory educational measures such as Teach Ted in reducing adverse outcomes associated with medical procedures [23], a further large-scale evaluation of its effectiveness, and including a control group for comparison, would be worthwhile. Importantly, participant outcomes measured in our study did not worsen, of which there was a risk given the delicate balance between delivering information about an upcoming procedure, without inducing further anxiety [24].

In our study, all but one child had previously experienced a blood test. Prior medical experiences have been shown to be closely related to families' anxiety in the lead up to a medical procedure [25]. It is important to mitigate anxiety about upcoming procedures as it can impact outcomes during hospitalization (e.g. decrease procedural cooperation) [26], and after discharge (e.g. phobias, avoidant health-care behaviours) [27]. The early data collected in this pilot study suggest that Teach Ted may have the potential to minimise negative outcomes even for families who are familiar with, and have undergone, blood tests previously.

In our study, one parent suggested making Teach Ted available online and accessible from home, in the lead up to a planned procedure. Teach Ted may be more impactful for those families less familiar with medical procedures, or living in rural and remote areas with limited access to these services, potentially amplifying their need for a resource like Teach Ted. Teach Ted is able to be easily implemented in hospital settings and was originally designed to reach children who don't have access to Child Life Therapists or trained health professionals, in particular in regional and rural areas.

The type of procedure that we studied (blood tests) may have impacted our findings. More complex or serious procedures (e.g. surgery) that more commonly induce anxiety in children and parents could mean greater potential to reduce negative outcomes. It may be valuable to evaluate Teach Ted in children undergoing other medical procedures

and assess the effect of increased use and exposure to if offering Teach Ted to patients to use from home and potentially multiple times leading up to their planned procedure. Nevertheless, blood tests provided a safe and practical context in which to pilot test the Teach Ted application and facilitate the potential for the “Ted” character to be adapted to other medical procedures to offer support to families in those contexts.

4.2. Innovation

This study makes an important contribution to efforts to improve the experiences of children undergoing medical procedures, particularly young children who are more vulnerable to negative outcomes relating to their procedure. Young children may not fully understand the reason for their procedure or may be able to express themselves, perpetuating the likelihood of a negative experience or adverse outcomes (e.g. anxiety, stressors) relating to their procedure. Although evidence-based interventions such as play therapy are becoming more common, they may be less available or readily accessible by patients in lower resource or rural/remote settings and are not available to families outside of the hospital setting. Interventions are also often targeted at older children rather than younger children, [7,8] or uptake in very young children (e.g. 4–5 years) is low. [9] Teach Ted has the potential to complement existing high-resource interventions and to additionally reach families with young children who are preparing for an upcoming procedure from their home, to educate them and help to mitigate negative outcomes.

4.3. Strengths and limitations

Our study was strengthened by the inclusion of multiple perspectives including the child, parent, and health professional. Gaining feedback and acceptability across all stakeholder groups could reflect its likely success in practice, yet we focused on parent’s acceptability of Teach Ted and not their child’s also. Our pilot sample size was small and notably only three health professionals participated. Health professionals are an important target for future interventions given their vital role in minimising procedural distress in children. Recruitment for this study was substantially impacted by the COVID-19 pandemic, resulting in protocol changes to maximise recruitment efforts including (e.g. dropping the originally planned control group and planned approach to families in the weeks leading up to their procedure, which would have allowed us to evaluate the potential effect of increased exposure). In addition, the challenging recruitment conditions and varying recruitment methods (e.g. posters) mean that we were unable to calculate a definitive response rate. For this pilot study, Teach Ted was only available in English, limiting its generalisability to culturally and linguistically diverse groups. However, other Teach Ted tools have since been translated (e.g. to Mandarin; <https://teachtred.com.au/covid19>) and would be worthwhile evaluating.

4.4. Conclusion

Parents and health professionals in this pilot study endorsed the use of Teach Ted to prepare for a child’s blood test. Pending further evaluation and implementation in clinical practice, Teach Ted may have the potential to create a real change for children undergoing painful and stressful medical procedures and their families by alleviating the emotional distress of medical procedures endured by both children and their parents. Further large-scale research is needed to determine the effectiveness of Teach Ted on these outcomes and when compared with families who did not use Teach Ted.

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CRediT authorship contribution statement

Christina Signorelli: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **Lauren Kelada:** Data curation, Methodology, Project administration, Writing – review & editing, Conceptualization, Investigation, Resources, Supervision. **Claire E. Wakefield:** Conceptualization, Funding acquisition, Investigation, Resources, Writing – review & editing. **Joseph E. Alchin:** Data curation, Investigation, Methodology, Project administration, Visualization, Writing – review & editing. **Irene Adam:** Conceptualization, Investigation, Project administration, Writing – review & editing. **Peta Hoffmann:** Data curation, Investigation, Methodology, Project administration, Resources, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that support the findings of this study are not publicly available due to privacy or ethical restrictions, and the full dataset is not able to be released due to ethical restrictions. Requests may be made to the authors.

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