STARLIGHT

VIRTUAL REALITY DISTRACTION THERAPY REPORT 2022

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dubit

leeds children's hospital

NHS The Leeds Teaching Hospitals NHS Trust

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Executive Summary

1. Background

Starlight has partnered with Leeds Children's Hospital and Leeds Hospital Charity to explore new ways to improve the delivery and experience of treatment, as well as reducing the anxiety and stress of the children and young people in hospital. Distraction Therapy is often used during procedures to reduce pain and improve the hospital experience for children and young people, and we sought to find out if combining distraction therapy with virtual reality enhanced this impact on treatment. Using virtual reality (VR) Headsets, donated by Dubit preloaded with child-friendly games and experiences, we tested out the impact of VR in two phases:

- **Phase 1** – Children and young people were offered VR or standard distraction (iPad).
- **Phase 2** – Children and young people were offered VR or other form of technologies to play with (i.e., gaming, storytelling device and projectors).

Overall, the findings on the impact of VR suggest that it can be an effective form of distraction therapy. A breakdown of these findings can be found below.

2. Findings

2.1. VR has a positive impact on the experience of treatment

In 79% of the cases, the VR technology was inclusive of children's needs. The Health Play Specialist found VR easy to operate in 80% of cases, particularly in pre-planned procedures. In the 24% of cases where the HPS did not think VR had a positive impact, this was mainly due to teething issues with getting the VR to work. In contrast, only two children agreed VR made treatment worse. 91% of children who used VR for the whole treatment said it made treatment better. Although these children were undergoing potentially very painful procedures, 87% of children said they felt little or no pain during treatment. Children predominantly reported feeling more happy, relaxed and confident when using VR, rather than anxious, worried and afraid about treatment.

2.2. VR is an effective form of distraction in treatment

When given the choice of what to play with during treatment, 95% of children picked VR and 92% of these found it easy to use. When children were asked to elaborate on the impact of VR, the majority of children that responded said it was distracting. Of those children who used VR for the whole treatment, 81% said they would like to use it again.

2.3. It is important to have a trained health play specialist delivering the VR as part of the treatment

We believe most of the success of this study can be attributed to having a Health Play Specialist delivering the VR and conducting the action research. 81% of children who were referred, took part in the study. Furthermore, over 70% of children also took part in the follow-up survey. We would not have been able to have such high uptake, low attrition rates and such high satisfaction rates if it wasn't for having a Play Specialist. We also would not have been able to capture the richness in data that we captured by having a Play Specialist collecting the data and insight.

> For the implementation of VR to be a success, it needs to be delivered by a trained health play professional.

2.4. This is the first study of its size and kind in the UK

110 children took part in this study indicating it is one of the largest studies in the UK on the use of VR in play in hospital. This piece of action research is also one of very few studies conducted by a Health Play Specialist.

2.5. The efficiencies made by using VR suggest this could have economic value to the NHS's use of resources

For children and young people (CYP) using VR for the whole of their treatment, on average treatment was completed in under eight minutes and in most cases, it only took one attempt to deliver that treatment. This overall average (median) is lower when compared to the other groups in this study. Within this study we have been able to gather case studies that illustrate using VR can result in efficiencies in treatment which can have economic value for the NHS, or in this particular case, Leeds Children's Hospital.

3. Conclusion

This study suggests that VR improves delivery of treatment and helps CYP feel less anxious and stressed in hospital. Like the findings of Leeds Beckett's REA, on the whole, children and young people had a positive experience of VR, leaving long-lasting positive memories of treatment. Emerging findings indicate that this could lead to efficiencies in the delivery of healthcare in the NHS whilst children and young people are having a more positive experience of treatment. The study also underlines the importance of Health Play Specialists, and their integral role in the delivery of VR interventions.

1. Background

For many children and young people (CYP), the experience of being in hospital and receiving treatment can be distressing and sometimes, a traumatic event. Some CYP in hospital will have certain conditions that will require them to attend hospital on a regular basis, and this can have a further long-term impact on their mental health and wellbeing. Studies such as Brown and Patte (2013) found that the most important function of play in hospital context is its ability to distract CYP from their fears and anxieties. Play can be integral to the socialisation of CYP, enabling CYP to play together, to make social connections and offer social support. Studies that have explored the value of technology for play, found that it provided the opportunity for increasing the level of control and connection CYP have in hospital (Tonkin & Etchells, 2014) as well as being a great form of distraction. Tonkin and Etchells (2014) have found that new technologies have great potential in providing opportunities for CYP's play in hospital.

Prior to this research, in support of this study, Leeds Beckett University conducted a Rapid Evidence Assessment (REA) of 60 publications on the use of technology for play in hospital. The focus on the use of technology for play across the literature is largely on distraction and diversionary play. This has mainly been used in the fields of oncology, burns management and treatment, outpatient, pre-operative, and dentistry. However, the findings from these pieces of research are still inconclusive and further research is needed to strengthen our understanding of the impact of Virtual Reality (VR).

Starlight has partnered with Leeds Children's Hospital to explore new ways to make hospital treatment safer, and less stressful for CYP. Distraction Therapy is often used during procedures to reduce pain and improve the hospital experience for CYP. We know from Leeds Beckett's REA, that VR can have the following impacts:

- Better experience and delivery of treatment
- Reduces the feeling of pain
- CYP cope better with treatment
- Reduces anxiety, stress, distress and isolation
- It reduces need for sedation and analgesia
- It improves emotional wellbeing

In a bid to improve the delivery and experience of CYP receiving invasive treatment in hospital, in order to improve safety of the delivery of treatment as well as improve the wellbeing of CYP, this study aims to add to the literature in this area and build a stronger understanding of VR in these settings. The aim of this project is to assess the impact of 'Virtual Reality Distraction Therapy' (VRDT), compared to standard distraction and other technologies, digital story telling devices (e.g. Toniebox), gaming bundles and projectors, on CYP receiving different types of invasive hospital treatment. By providing an option for CYP to make use of technology during invasive treatment, we hope to understand whether it improves the delivery and experience of treatment, as well as reducing the anxiety and stress of CYP.

1.1. Key Objectives

This study has nine key objectives:

Objective	What we sought to find out
1	Levels of uptake and engagement with VR, including how easy it was to use
2	How well VR worked in different medical settings
3	Impact of VR on delivery of treatment
4	Impact of VR on length of stay in hospital and need for sedation/analgesia
5	Impact of VR on the experience of treatment
6	How VR compared with other forms of distraction
7	Impact of VR on wellbeing
8	Impact of VR on perception of pain
9	Whether Starlight and Leeds Children's Hospital should invest in VR

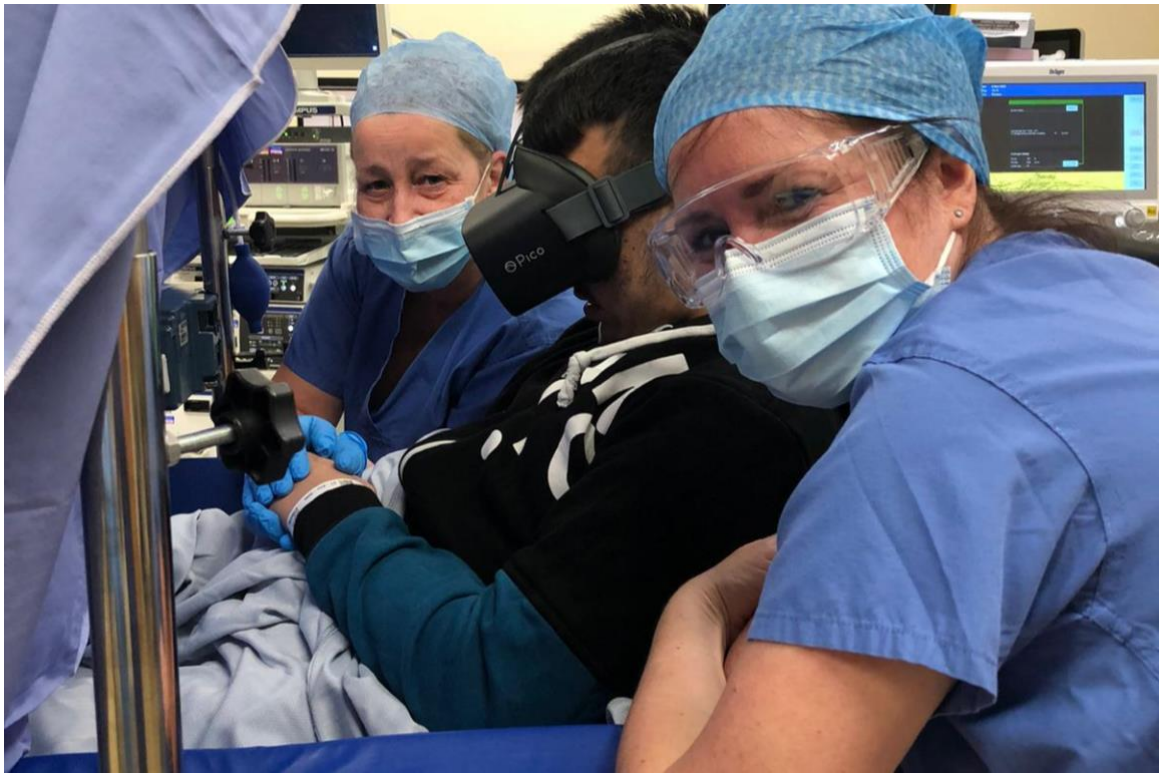
1.2. Methodology

During the period October to December 2021 (Phase 1), 8-18 year-olds attending Leeds Children's Hospital were offered the choice of watching a video through VR headsets, during the procedure, or to receive standard distraction (which may involve a book, or video on a tablet). These headsets were donated by Dubit and were preloaded with child-friendly games and experiences. Sixty-nine CYP undergoing a range of treatments have taken part in this study. Below is a breakdown of the participants.

Between January to March 2022 (Phase 2), 41 CYP aged 8-18 years attending Leeds Children's Hospital were offered the choice of watching a video or playing a game through VR goggles during the procedure, or to receive one of the following: Nintendo Gaming Device, Toniebox Story Telling Device, Light Projector or Film Projector.

CYP were asked to fill out a data collection form before and after the procedure on how easy it was to use, how their experience of VR and treatment was, and the impact it had on their wellbeing and experience of pain. A Health Play Specialist (HPS), seconded to this study to conduct the research, also filled out a form with her observations. All data has then been analysed by researchers at Starlight and Leeds Children's Hospital.

Sitting alongside this study, Leeds Beckett University (Long and Everett, 2021; forthcoming) conducted a Rapid Evidence Assessment (REA) of the literature on the use of technology for play in hospital. An overview of the methods of the REA can be found in Appendix 1.



2. Findings

Overall, our study has found that VRDT does improve the delivery and experience of CYP receiving invasive treatment in hospital. We set out with nine key objectives. Having completed our research, we were able to map out our results against each of the objectives:

Objective	What we sought to find out	Results
1	Levels of uptake and engagement with VR, including how easy it was to use	There was a high level of uptake and engagement with VR. Both CYP and health professionals found it easy to use.
2	How well VR worked in different medical settings	We tested VR in 13 different types of treatment. Health professionals were able to integrate VR into most procedures with the support of a HPS.
3	Impact of VR on delivery of treatment	VR improved the delivery of treatment making it easier for health practitioners to administer treatment in fewer attempts and less time whilst CYP were happily distracted.
4	Impact of VR on length of stay in hospital and need for sedation/analgesia	Although all the procedures being undertaken, in theory, could involve anaesthetic or sedation, this was only administered in under half of treatments using VR. In some cases, VR actively negated the need for sedation and analgesia.
5	Impact of VR on the experience of treatment	The majority of CYP felt that VR made the experience of treatment better, even when we followed up a few weeks after treatment.
6	How VR compared with other forms of distraction	VR was the most popular form of distraction in this study. Although we had a very limited comparison group, most CYP opted to use VR and seemed to have a better experience than those who did not use VR or only used it for some of the time.

7	Impact of VR on wellbeing	VR seemed to have a positive impact on wellbeing, as the majority of CYP using it talked about feeling happy, confident and relaxed, and in the follow up continued to have those positive memories of treatment.
8	Impact of VR on perception of pain	Most CYP using VR said they felt little or no pain during treatment, and that perception continued weeks after leaving treatment.
9	Whether Starlight and Leeds Children's Hospital should invest in VR	As a result of our findings, both Starlight and Leeds Children's Hospital feel that we should invest in rolling out and testing VR in hospital treatment even further.

Table 1: Showing what this study found against each of the nine study objectives

These results have led us to four main findings which are detailed in the following sections.

2.1. VR has a positive impact on the experience of treatment

On the whole, CYP reported that they had more fun using VR, stating that it took their mind off what was happening and that they were distracted from the procedure. Furthermore, the HPS was able to incorporate it into most treatments.

2.1.1. In 79% of the cases, VR was inclusive of most children and young people's needs

In most cases, the HPS found that VR was inclusive of the CYP's needs. Only two young people were not able to use it, because they opted for a type of sedation that did not allow them to use the goggles, and one opted not to use it and preferred to observe the treatment.

> "Unfortunately, it didn't work. I normally use an Entonox mask and could not use this with the VR headset as it didn't fit with it. If I could have used both I think the VR might have helped but I had to take it off and go back to the Entonox."

Some of neurodiverse CYP had difficulty in using the VR, and in some cases, CYP were not able to get the positioning right in the treatment with the headset (e.g., having a lumbar puncture). However, this happened in only a small number of cases.

2.1.2. The Health Play Specialist also found VR easy to operate in 80% of cases, particularly in pre-planned procedures

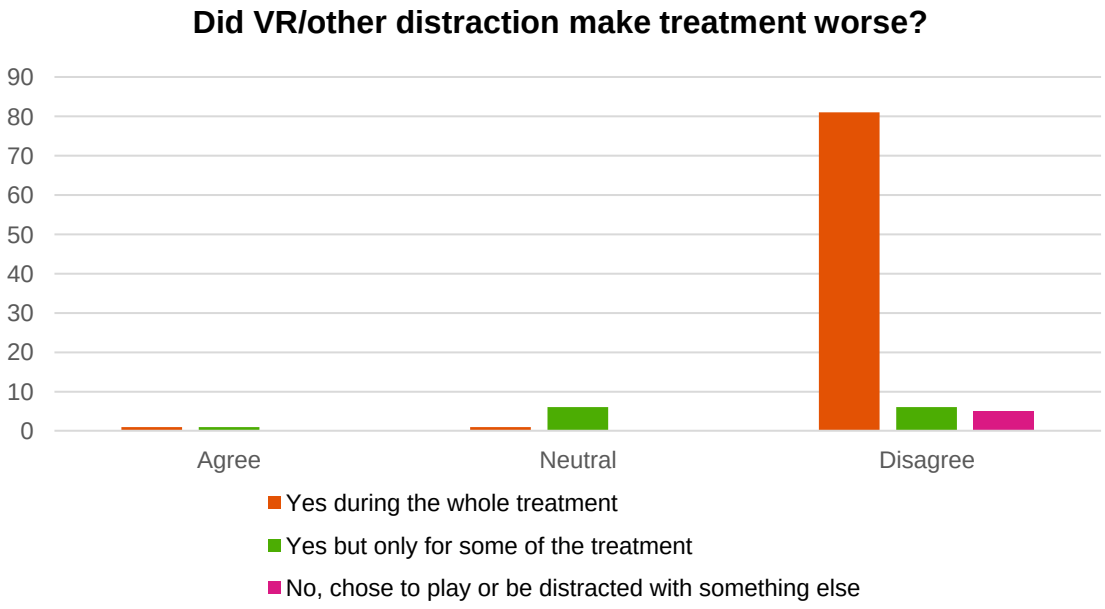
Having a Specialist delivering VR, worked really well in hospital settings where CYP were having a planned procedure e.g., cannulation on admission for routine IV infusions, blood tests, dress changes, etc. Health professionals working in these areas were able to refer CYP for VR in advance. In cases where procedures were less proactive and delivered as and when necessary, these were not so easily scheduled in, as they were hard to reach at short notice.

2.1.3. In 24% of cases the Health Play Specialist did not think VR had a positive impact, this was mainly due to teething issues with getting the VR to work.

The headset we used for the study did present some problems with the set-up as it did not have a screen mirroring function. The patient had to be able to navigate between different games, otherwise the headset would need to be removed for the HPS to set it up for them. There are headsets which can be controlled by the HPS from a tablet. We would consider using those in future to cancel out these usability issues.

2.1.4. In contrast, only two children and young people agreed VR made treatment worse

The majority of CYP found that the VR headsets did not make treatment worse. Six CYP who had only used VR for some of the time selected ‘neutral’ when asked if VR made treatment worse. The five CYP who used other forms of distraction, disagreed that the distraction made it worse.



Eight experienced side effects. One child reported having a headache and seven experienced some dizziness during or after use:

> “It was good and fun. It distracted me very well, although after I felt lightheaded. It was stingy a little bit, but it wasn’t that bad.”

However, in most cases the side effects wore off in under 10 minutes, and in one case it took between 10-12 minutes to wear off. Some CYP also mentioned that they did not like the fact that they were not able to see what was going on with their treatment.

> I didn't like it because I was unaware of what was going on.

2.1.5. 91% of children and young people who used VR for the whole treatment said it made treatment better.

When we asked CYP to comment on their experience of using VR, many fed back that it improved their treatment.

> It hurt when the needle went in but didn't last long at all.

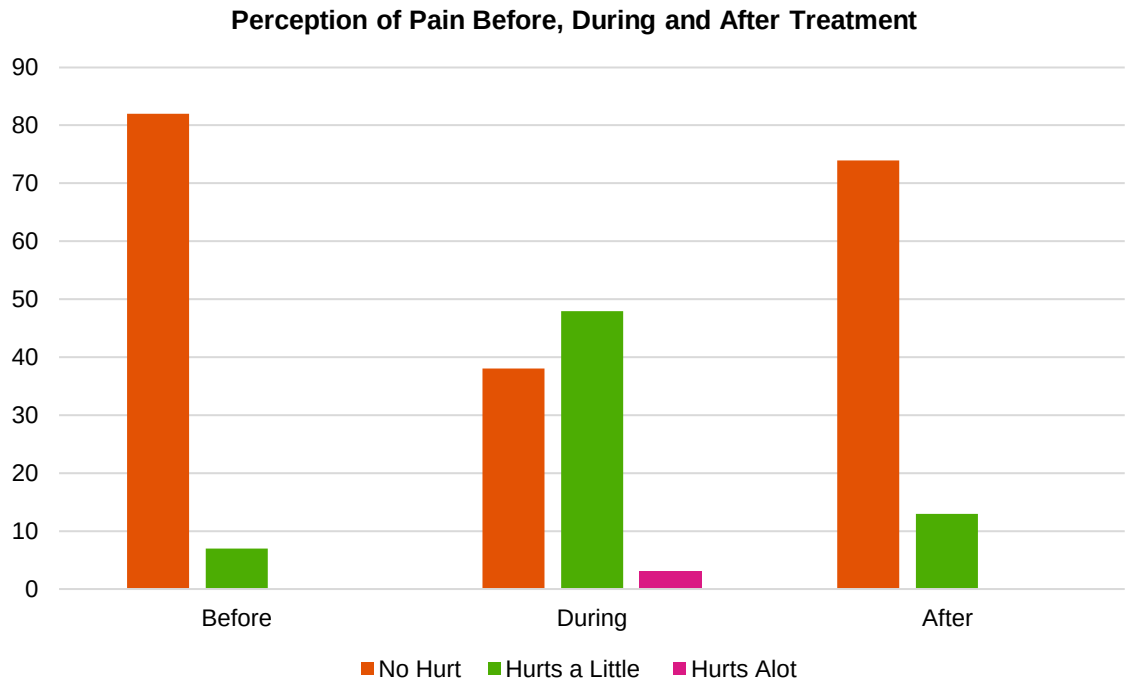
Some CYP talked about how using VR completely transformed their experience of treatment for the better because it took their attention away from treatment and focussed it on the VR. This was particularly the case for CYP who had that treatment before.

When we followed up a few weeks later with the CYP that had used VR, of the 72 who responded to the survey, 64% felt that their treatment had gone very well and 22% said it went well, meaning that their experience of using VR during treatment left them with positive memories of the experience.

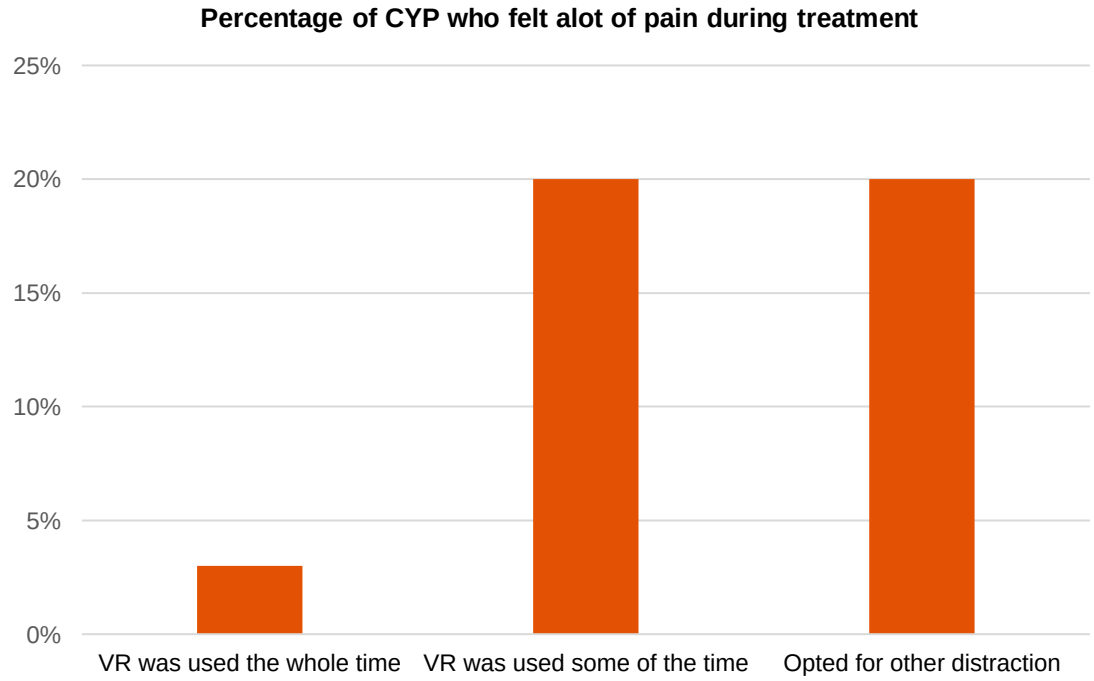
> I loved it. It was great, I didn't think about what I was having done. I liked the chosen distraction."

2.1.6. Although children and young people were undergoing potentially very painful procedures, 87% of children and young people felt little or no pain when using VR.

The procedures in which we tested the VR can be potentially very painful procedures. Although, in all cases, VR did not completely take away the perception of pain, the majority of CYP reported feeling little or no pain.



Only 3 reported feeling a lot of pain. If we compare the percentage of CYP that used VR for the whole time, with those who used VR for some of the time or used other distraction, proportionally more CYP felt a lot of pain when only using VR some of the time or not at all.



For those CYP who used VR the whole time, some CYP commented on how, by taking away the focus from the treatment and focussing on the VR, they were less cognisant of pain even when they were aware the treatment had started.

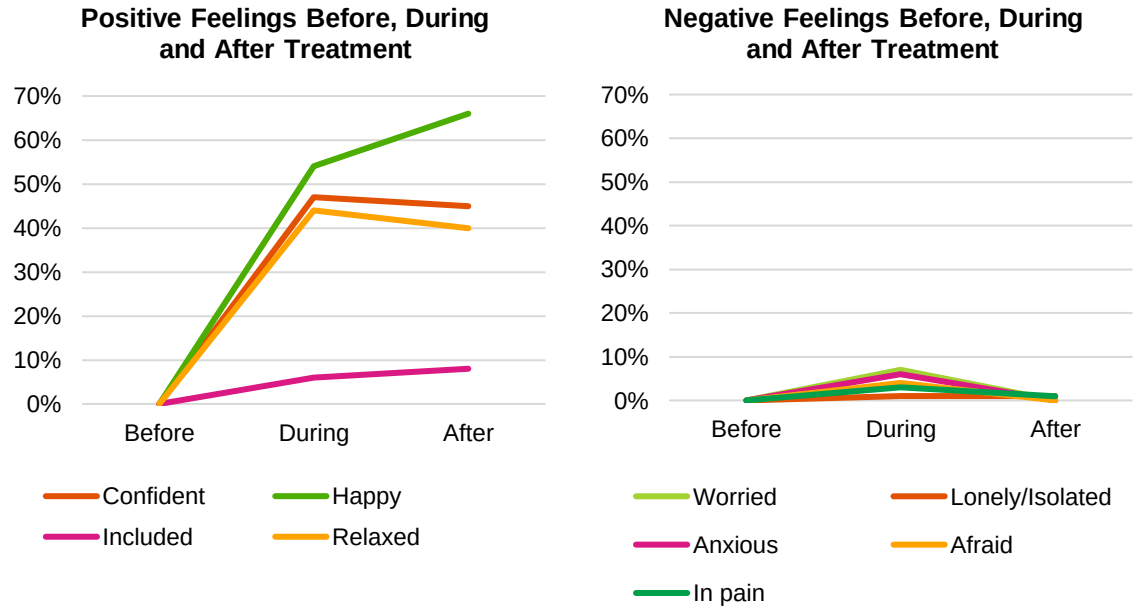
> I felt really relaxed and I felt a small pinch and then it was over. I didn't feel much pain at all. I was more focused on the VR than what was going on around me.

Although VR may not take away the feeling of pain, it seems to minimise the patient's awareness of it.

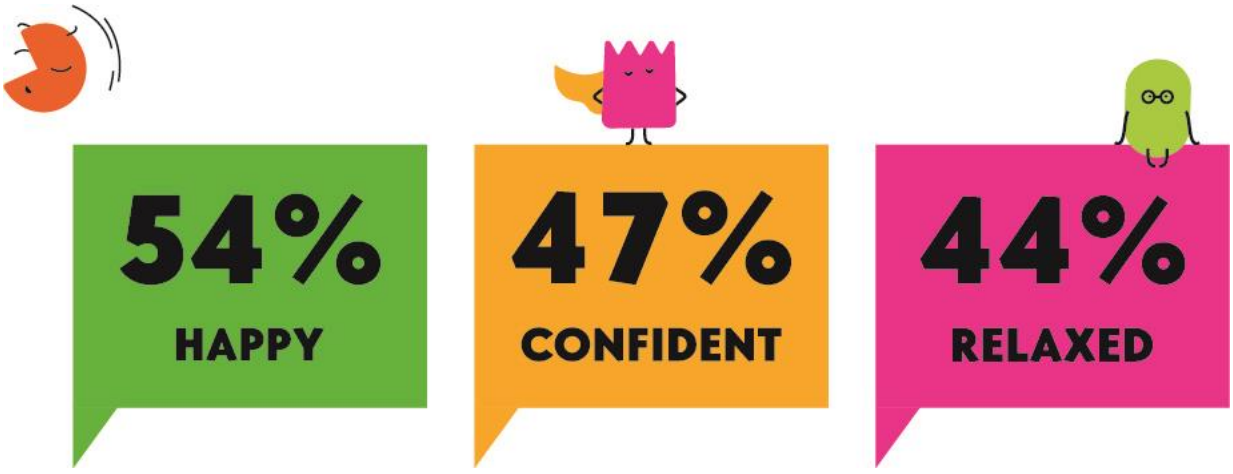
A few weeks after the procedure, we asked CYP who had used VR for the whole procedure about the pain they felt during the procedure. 46% remembered it not hurting at all, and the remaining respondents said it hurt a little. When we compared this with eight CYP who used standard distraction or VR only for some of the time who also fed back a few weeks later, two said they remember feeling no pain, five remembered feeling a little pain and one remembered it hurting a lot. Although the sample size is small for the comparative group, this indicates that CYP who used VR for the whole treatment tended to perceive feeling less pain beyond treatment.

2.1.7. Children and young people predominantly reported feeling more happy, relaxed and confident when using VR, rather than anxious, worried and afraid about treatment.

Most CYP fed back that they had a great time and the whole experience was really distracting and relaxing. If we look at how they were feeling before, during and after:



We found a small number of CYP (under 10 responses) who used VR throughout treatment felt worried and anxious when using VR. Often this was associated with not being able to see what was happening. However, most CYP reported uplifting feelings during treatment, such as:



If we compare those top three emotions during treatment with CYP only using VR for some of the time (N=15), 13% reported feeling happy, 27% confident and 13% were relaxed. However, despite this being a significantly smaller sample, almost the same number of CYP in this cohort reported feeling anxious and afraid. This is exemplified in the case study below:

Case Study 1: Dressing Change

One patient opting to use VR, was a nine-year-old who had undergone reconstructive surgery to her thumb after an accident in the kitchen. During her first dressing change at clinic, the dressing was so badly stuck that it required soaking for 20 minutes and was very distressing. When she arrived for her second appointment at clinic, the child was crying and clinging on to her dad. The nurse reassured her that this time it would be different, and that the dressing would not be stuck. However, the patient remained distressed. The HPS suggested that the child could play with the VR whilst she was having the dressing changed. The child was told that she could try the VR first and promised that the nurse would not attempt to do anything until she was ready and settled into a game or relaxation program. This helped the child to build confidence, get up onto the examination bed and put on the VR headset. After a few minutes with VR, the nurse gently told her she was going to start removing the top bandage. The child cooperated throughout, taking it one step at a time and using VR throughout. At the end of the procedure, the child said she hadn't felt a thing.

Some CYP who used VR for the whole time commented that they would usually feel quite stressed and distressed when having their treatment. By using VR, they had a very different, happier and more relaxed experience.

> “ Normally I'd be very upset, but I didn't even know they were doing it this time. I was laughing during the procedure and after. If I knew I was having that every time I'd be much more relaxed about coming for my treatment.

When we followed up a few weeks later, of the 72 who had used VR throughout treatment, 42% remembered being happy, 40% remembered being confident, and 44% remember being relaxed. Two CYP remember feeling worried and four feeling anxious. This suggests that VR created sustained, positive memories, beyond treatment.

Overall, the use of VR was easily integrated into the delivery of treatment with the support of a Health Play Specialist. Although we have a limited comparison group, when we did compare the children and young people using VR for the whole treatment to the other groups taking part in this study, we noticed that those using VR throughout seem to have a better experience of treatment overall. Furthermore, when we followed up, the majority of children and young people continued having positive memories of treatment long after they left.

> “ I would love to use it again, it really helped me. I needed showing how to set it up but then it was easy to use... was really good and exciting.

2.2. VR is an effective form of distraction in treatment

All CYP taking part in this study were given the choice of different opportunities for play. In Phase 1 they could pick between VR and a standard form of distraction (mainly iPad) and in Phase 2, between VR and other forms of technologies for play.

2.2.1. When given the choice of what to play with during treatment, 95% of children and young people picked VR

Most CYP opted to use the VR during treatment and 81% of the 110 CYP used VR for the whole treatment.

	Number of CYP (Phase 1)		Number of CYP (Phase 2)		Total number of CYP	
Did the patient use VR during treatment	**Count**	**Percentage**	**Count**	**Percentage**	**Count**	**Percentage**
Yes, during the whole treatment	57	83%	32	78%	89	81%
Yes, but only for some of the treatment	9	13%	6	15%	15	14%
No	3	4%	3	7%	6	5%
Total	69	100%	41	100%	110	100%

Table 2: Showing the breakdown of what CYP opted to play with during treatment

As highlighted in Table 1, even in Phase 2, where CYP were offered different fun tech and gaming devices to play with, they preferred to opt for VR.

2.2.2. 92% of children and young people who used VR found it easy to use

The majority of CYP who used the VR for the whole treatment, said it was easy to use, and they needed minimal support. However, a few CYP said that it took time to get used to it and needed some support to understand how to work the VR technology. Having a HPS (Tracey) there to support them was really helpful.

> “ It was easy to use as I had someone tell me step by step how to use it. It is pretty self-explanatory to use.

> I really, really, really, really, really, liked it!!!!!!!!!! Tracey helped me and is very, very, very, very, very, fun!!!!!!!!!!!!

Some CYP had difficulty putting on the headset properly which impacted on their experience.

> At first I couldn't see the games because it wasn't on my head properly but after that it was really good."

Having a trained HPS on hand to support them, made a significant difference to when these issues emerged. Once the HPS helped rectify problems, they were able to have the full VR experience.

2.2.3. When children and young people were asked to elaborate on the impact of VR, the majority said it was distracting

When asked to elaborate, 49 of CYP that responded told us that VR was a good form of distraction, making the hospital experience more enjoyable.

> It was good. It distracted me, I enjoyed it. pain was a lot better; I usually cry."

Nearly half the CYP who responded also mentioned how they were less aware of what was happening, and some even said they did not feel a thing.

> It was fun, and it did distract me because I didn't really notice."

Most CYP commented on how VR really improved their experience of treatment.

2.2.4. 81% of children and young people who used VR for the whole treatment said they would like to use it again

The positive impact and memory of using VR lasted beyond treatment. Shortly after the procedure, the majority of CYP said they would use VR again , 79% of the CYP who responded to the follow-up survey a few weeks later continued to say the same thing.

VR during treatment was found to be distracting, which means children and young people are not concentrating on what is happening and how treatment is making them feel, which in turn improves the delivery of treatment. For some they were so distracted they didn't even notice the treatment happening.

2.3. It is important to have a trained health play specialist delivering VR as part of treatment

We believe much of the success of this study was down to having a HPS delivering the VR and conducting the research. Since starting this study, the HPS seconded to this work, has been nominated for awards by a number of her colleagues, due to the positive impact she was having on treatment. When talking about their experience of VR, many CYP commented on how having the HPS there, to support them and guide them through it, made a difference to their experience of VR. When asked what they would change, one child said:

> “ Nothing! Tracy was great fun.

2.3.1. 81% of children and young people referred, took part in the study

Having that HPS established in that Hospital’s working practice, we believe, led to the high number of referrals and a high number of CYP taking part in the study.

2.3.2. Over 70% of CYP took part in the follow-up survey.

Furthermore, the relationship and rapport that the HPS had with the CYP and families, meant that they felt comfortable to fully take part in the study, and led to a low attrition rate in the follow up survey.

The high success and satisfaction rates, as well as the richness of the data we collected indicated that having a HPS guiding this study had a significant impact.

> For the implementation of VR to be a success, it needs to be delivered by a trained health play professional.

2.4. This is the first study of its size and kind in the UK

2.4.1. This is one of the largest studies in the UK on the use of VR in play in hospital

The REA conducted by Leeds Beckett University found 26 publications relating to the use of VR in play in hospital. This was the most common type of technology researched in the literature. Most of these studies on the use of VR, had very small sample sizes, and the few studies that had over 100 CYP were conducted outside of the UK. This leads us to believe that this is the one of largest studies, if not the largest, to have ever been conducted in the UK on the use of VR in CYP's play in hospital treatment.

2.4.2. 110 children and young people took part in this study

After undergoing an initial assessment by the HPS on whether it was appropriate to take part, 110 CYP were selected to take part in his study. Ninety-nine of the CYP taking part had previously received the same treatment without the VR, and 59 CYP had previously played with VR. Sixty-nine took part in Phase 1 of the study (VR vs. standard distraction) and 41 took part in Phase 2 (VR vs. other technologies for play). This study also spanned 14 different types of treatment, depicted below.

The majority of CYP were undergoing cannulations, but there were several CYP also undergoing other more painful and invasive procedures.

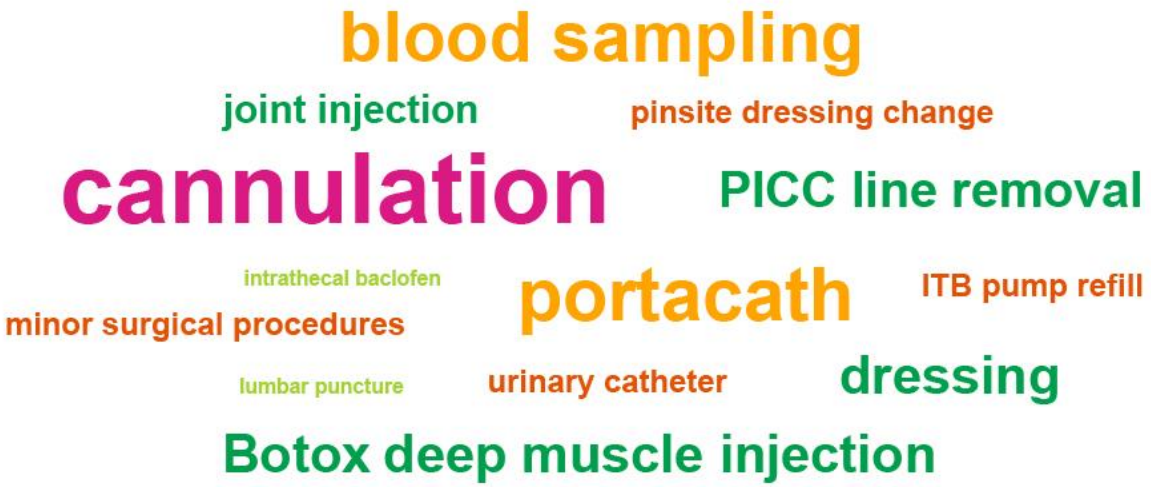


Fig 1: Word Cloud depicting the types of treatment where the VR study took place

2.4.3. This piece of action research is one of very few studies conducted by a Health Play Specialist

In this study Starlight Children's Foundation and Leeds Children's Hospital paired up to train and supervise a highly experienced HPS to administer the VR and collect the data for this study. To our knowledge this has not been done before.

> Action research: Koshy, V. (2010) define action research as healthcare practitioners conducting systematic enquiries in order to help them improve their own practices, which in turn can enhance their working environment and the working environments of those who are part of it – clients, CYP, and users.

Koshy, V. (2010) go on to highlight how there is significant value to conducting action research. It empowers health practitioners to identify solutions through the power of research. They will have a unique perspective on their practice, which will allow them to have insight into problems and issues they encounter. They can then use research skills to identify and implement solutions, whilst monitoring and reflecting on the practice and subsequent outcomes. This in turn can help create a robust evidence-based practice.

This is something we observed in our study. By having a HPS delivering VR through this process, although they are doing this for research, they are building good practice. The HPS had a rapport with other health practitioners, and through that she would receive 136 referrals to the study.

> By conducting this action research, we have learnt about the benefits of VR and through this, we were able to establish a process by which it can be easily integrated into Leeds Children's Hospital practice moving forward.

2.5. The efficiencies made by using VR suggest this could have economic value to the NHS' use of resources

For CYP using VR for the whole of their treatment, on average this treatment was completed in under eight minutes and in most cases, it only took one attempt to deliver that treatment. This overall average (median) is lower when compared to the other groups in this study. This indicates that VR is having some success in relaxing children, making them less stressed and more compliant and engaged with treatment. This is exemplified in the case study below:

Case Study 2: Cannulation

One child aged 11 needed an intravenous cannulation. She regularly attends hospital to have this procedure, and usually buries her head into her mum so that she can't see the needle. Her mum said that she always cries during the procedure and there have been occasions where it took four attempts with two different members of staff to insert the cannula. The child opted to use VR during the procedure and sat-up throughout without needing to have any physical contact with Mum. The VR kept her happy, distracted and relaxed and there was not one tear. Mum asked 'why this hasn't been available sooner and please could she have it every time we come in?'

In looking at the time taken to deliver a cannulation, the most common treatment in this study, we found that the average (median) time taken to deliver a cannulation was slightly quicker for CYP using VR for some of the time. If we look at the modal average, more CYP who used VR for the whole time completed their cannulation in five minutes (see table 2 below).

	Number of cannulations	Median Time (mins)	Modal Time (mins)
VR for the whole time	44	7	5
VR for some of the time	6	6	6
Other distraction	3	12	N/A (all over 8 minutes)

Table 3: Showing time taken to complete a cannulation using different types of distraction

The comparison group in this study is quite limited in size, which means, quantitatively speaking, it is hard to draw any conclusive results on how economical VR is in terms of delivering efficiencies to the NHS. However, qualitatively speaking we have been able to gather case studies that illustrate that using VR can result in efficiencies in treatment which can have economic value for the NHS, or in this particular case, Leeds Children's Hospital. This is illustrated in the case study below:

Case Study 3: Toenail Surgery

One 16-year-old boy had been booked in to remove both toenails. He was very receptive to the VR and had a trial run of it while he was still up on the day case unit. Having trialled the VR, and feeling confident about it, he agreed to undergoing the procedure with local anaesthetic and using the VR. This meant he did not need general anaesthetic for the procedure. The procedure was still performed in the theatres, due to it being the first VR non-general anaesthetic procedure. Unfortunately, this meant his father could not be with him.

A sheet was put up to block the view of the procedure, in case the patient removed the headset. He used the headset throughout the whole procedure. He was told when the local anaesthetic was about to be administered, as this is quite painful. At this point he became nervous, and the theatre nurse held his hand. He reacted to the injections but kept perfectly still and continued with the VR. There was no reaction to either of the toenail removals or the bandaging and he coped well. Afterwards he told his father that the injections were painful, but he appeared happy: smiling and joking. He said that the VR was "lovely" and that it had helped a lot. He thanked the HPS for letting him use it.

Had this procedure required general anaesthetic they would have required the following health professionals to facilitate the procedure

Consultant Anaesthetist - 20 mins

Band 5 Operating Department Practitioner (ODP) – 66 mins

Band 5 Staff nurse – 66 mins

Band 5 Theatre support worker – 66 mins

Instead, the procedure required the support of a Health Play Specialist for 90 mins.

This means an efficiency was made in terms of releasing the time of those three health professionals that would have otherwise been needed for the delivery of the general anaesthetic.

Furthermore, in terms of staffing costs, the surgery cost £47.04 less to complete.

Due to this and other similar procedures being a success, in future, Leeds Children’s Hospital will consider whether planned procedures using VR, and completed under local rather than general anaesthetic, can be performed outside operating theatres. This way parents will be able to accompany and support.

The use of VR in treatment can lead to efficiencies in the NHS. Children and young people who are anxious and stressed about treatment can often resist or delay treatment. The fact that the majority of participants were able to complete treatment in one attempt and in under 10 mins, indicates that this was not happening. Furthermore, our case studies show examples how efficiencies can be made by offering VR instead of general anaesthetic.

3. Conclusion

This study suggests that VR improves delivery of treatment and helps CYP feel less anxious and stressed in hospital. Like the findings of Leeds Beckett's REA, on the whole, children and young people had a positive experience of VR, leaving long-lasting positive memories of treatment. Emerging findings indicate that this could lead to efficiencies in the delivery of healthcare in the NHS whilst children and young people are having a more positive experience of treatment. The study also underlines the importance of Health Play Specialists, and their integral role in the delivery of VR interventions.

3.1. Next Steps

Starlight and Leeds Children's Hospital will expand this study to see if VR continues to have a sustained impact on CYP using it over time to support treatment. We will also test out this approach in multiple sites to see if we continue to have the same success.

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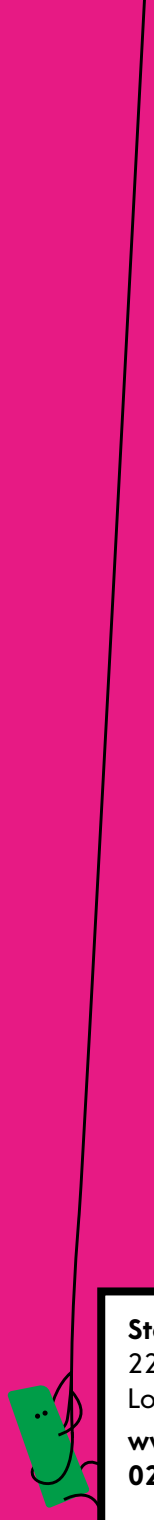
3.3. Appendix 1

3.3.1. Leeds Beckett Rapid Evidence Assessment Methodology - conducted by Alexandra Long and Nicky Everett

A rapid evidence assessment (REA) of over sixty papers, published between 2011 - 2021 reviewed literature discussing any intervention where technology was used to facilitate children's play or distraction whilst in a healthcare environment (Long & Everett, 2021). The research revealed that until 2008, the only technology available to hospitalised children was via the use of games controllers. However, as of 2018, computers were the most used technology for hospitalised children (Jurdi, et al., 2018). Since that point, the research identified the increasing use of iPads and tablets, Virtual Reality (VR), humanoid robots, serious games, interactive technology and personal devices within healthcare environments, used to facilitate children's play.



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