Using a robotic telepresence avatar to support pupils with physical and emotional health needs.

A thesis submitted to the University of Manchester for the degree of Doctorate in Educational and Child Psychology in the Faculty of Humanities

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Matthew T Fletcher

School of Environment, Education and Development

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List of abbreviations

APA	American Psychological Association
APDR	Assess Plan Do Review
CYP	Children and Young People
EBSA	Emotionally Based School Avoidance
EBP	Evidence-Based Practice
EP	Educational Psychologist
GDPR	General Data Protection Regulations
IT	Information Technology
LA	Local Authority
LRQ	Literature Review Question
PBE	Practice-Based Evidence
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RCT	Randomised Control Trial
RTA	Reflexive Thematic Analysis
RTT	Robotic Telepresence Technology
RQ	Research Question
SEMH	Social, Emotional and Mental Health
SENDCo	Special Educational Needs and Disabilities Coordinator
SLR	Systematic Literature Review
SSIs	Semi-Structured Interviews
TEP	Trainee Educational Psychologist
TR	Telepresence Robots
UK	United Kingdom
WoE	Weight of Evidence

Abstract

Background: An increasing number of Local Authorities (LAs) are utilising the 'AV1 robot' to support pupils (with health needs) to access the classroom environment remotely. Promising international research around these devices and growing LA reports are highlighting the device's perceived impact on attendance, attainment, and emotional well-being. However, there is a current gap within the evidence base, particularly around UK research and capturing user views to inform future implementation.

Methods/Participants: A systematic literature review (SLR) aimed to capture, synthesise, and evaluate user perspectives around robotic devices in schools (Paper One). Eleven papers were identified through the PRISMA framework, which reported views from users including pupils, parents, and school staff. Paper Two reports on an empirical investigation which adopted a qualitative, exploratory design, using semi-structured interviews to capture the experiences of ten, UK school staff using the AV1 robot.

Analysis/Findings: Paper One identified that there is a dearth of UK, peer reviewed research. Four global themes were reported: potential for robotic telepresence technology (RTT) to promote inclusion; potential for RTT to facilitate engagement; technical design factors influencing utility and acceptability of RTT to users. Paper Two reported three themes, relating to the AV1's perceived impact on child outcomes, as well as considerations around facilitators, barriers, and socio-economic accommodations. Findings lead to a discussion around implementation of robotic devices in the UK, introducing a proposed implementation framework which builds upon themes generated in Paper One and Two.

Conclusion/Implications: RTT, such as the AV1, is showing promising impact for specific pupil populations, however further research is required to evaluate effectiveness, using standardised measures, such as attendance and attainment data. Considerations for practitioner psychologists are discussed, alongside the introduction of a proposed implementation framework to inform future practice and research. Paper Three discusses evidence-based practice, implications for practitioner psychologists/professionals and how research findings will be disseminated.

Declaration

No portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning. This project was funded through England's Department for Education (DfE) National College for Teaching and Learning (NCTL) ITEP award 2018.

Copyright statement

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Introduction

Research aims

In the UK, there has been increased use of the AV1 robot, a telepresence device that can be used to support children and young people (CYP) with accessing their education remotely if they are unable to attend school due to health reasons (Fletcher & Bond, 2022). There has been an exponential growth in the use of these devices, with over 45 UK Local Authorities (LAs) trialling these devices to support pupils, following commissioning from the Department for Education (No Isolation, 2021). Whilst there is a range of international research that is highlighting the promising applications of these devices (Johannessen et al., 2022; Weibel et al., 2020), no UK-based academic research has been conducted, even though the devices are in use across the country. This identified a current gap in the literature that formed the aims of this research. This research aimed to explore the use of the AV1 from a UK context, exploring its potential utility as a form of support for pupils as well as considering how these devices (if effective) should be implemented.

This thesis is separated into three papers. Paper One reports on a systematic literature review (SLR) of existing research around robotic telepresence devices, including the AV1. It aimed to synthesise existing findings about these devices, collating the views and experiences of users such as CYP, parents and school staff. The rationale for this type of systematic review was informed by existing literature in this field, which highlighted the need for research to shift from scoping reviews to SLRs in order to fully explore the quality of research in the telepresence field and its potential for supporting pupils with health needs (Page et al., 2021). Key findings highlighted the need to capture more detailed information around the experiences of user groups as well as the need for further high-quality research studies to inform the evidence base.

This information then informed the design of Paper Two, which conducted an empirical-based study via semi-structured interviews, to capture the experiences of school staff who had used the AV1 device within their setting. Key findings highlighted the promising application of the devices to support attainment, attendance, and emotional well-being; however, there were also socio-economic factors that required future considerations. Paper

Two then concludes with the introduction of a proposed framework for implementation to support professionals who are trialling the AV1s. Paper Three provides an outline of the researcher's dissemination and evaluation strategy, as well as specific considerations around how to disseminate aspects of Paper One and Paper Two to different audiences.

The research commissioning

The research project was commissioned by a manager within a North West LA through the University of Manchester's research commissioning process. They hoped to capture UK-based feedback around the AV1 device to inform implementation of these devices within their LA. The initial proposal involved capturing a variety of user experiences, including pupils, parents, and school staff. The original project design, proposed by the researcher, was a mixed-method, multi-case study design, which captured both quantitative (attendance/attainment) and qualitative (user perspectives) data. After several months of advertising, zero participants were recruited. Informal feedback from schools, who had been contacted, highlighted that they were concerned with adding additional duress to pupils who had only begun to trial the AV1 device.

This raised specific ethical issues around the researcher's desire to capture user experiences but also the reported concerns around placing stress on vulnerable pupils. In consideration of this and following discussions with the commissioner, the design of the project was changed, to focus on capturing user perspectives of school staff first. This shift in design for Paper Two, was also justified by existing research and the findings of Paper One (Fletcher et al., 2023), which promoted the need to capture more in depth feedback from multiple user groups, including school staff. The researcher and commissioner both agreed that there was a need to capture pupil views, however this could be sought in future research, once the AV1 devices had been embedded further and pupils felt more comfortable to engage with research projects. Aspects of the interview schedule for Paper Two did include questions which considered the perspectives of pupils, which served as foundational data to inform future studies which may focus on capturing pupil views directly. In consideration of safeguarding participant welfare, participants were also signposted to external agencies should they require any further mental health support following the research project. The

researcher also utilised their counselling skills (see below), during any interviews, to ensure that the interview space was safe, welcoming, and considerate of participant needs.

The researcher's professional background and relevant experience

The researcher is currently a trainee educational psychologist (TEP), studying at the University of Manchester. They hold a BA (Hons) with QTS degree in Primary Education from the University of Chester and a MSc degree in Psychology (Conversion) from the University of Chester. The researcher previously was a primary teacher within a mainstream school, teaching across the Year 3-6 age range. They also worked as a 1:1 teaching assistant, within a Nursery setting, to support a child with significant, social communication needs. Additionally, the researcher worked as a staff counsellor at Childline for three years, providing advice and support to CYP aged 5-19, via telephone, online 1-2-1 chat services and email. For the last two years, alongside the doctorate, they have continued to work as a locum Childline supervisor, managing a room of counsellors and conducting risk assessments on the presenting contacts. Their background experiences highlighted to the researcher the positive impact that technology can have in providing CYP access to mental health support, contributing to their interest in this research field.

In this present research, the researcher has drawn from their knowledge and experience within the education sector, their practice within Childline of working with significant social, emotional and mental health needs as well as their understanding and application of psychology acquired through their TEP training. It is hoped by the researcher that this research will increase awareness around the use of specialist technology to support the most vulnerable pupils within education settings, as well as increasing the confidence of professionals who are already implementing this technology across the country.

Rationale for engagement

The researcher's teaching experience and ongoing involvement at Childline had highlighted that for many CYP, technology provides a means for them to engage in support services with adults. Their training as a TEP had also highlighted the increasing amount of casework relating to pupils experiencing emotionally based school avoidance (EBSA) following a

return to education after the covid-19 lockdown. During the commissioning process, the researcher spent time exploring the AV1 devices, watching case study videos and reading existing research. This affirmed their beliefs that the technology should be explored further to establish whether it can support the most vulnerable pupils, including those experiencing EBSA. Following allocation to this project, the researcher outlined to the commissioner their aims of ensuring this research was both impartial (to establish if the devices were genuinely effective) and informative to support professionals.

Positioning for data access

The empirical research of Paper Two was conducted nationally. The researcher, through the commissioner, was introduced to a point of contact within No Isolation, the AV1 company. No Isolation had contacts with every school currently utilising an AV1 device and were able to support the researcher with recruitment, such as sending emails on their behalf to schools. The researcher also attended the monthly, North West AV1 working group, which had representatives from a variety of North West LAs, who also supported the dissemination of recruitment materials.

Evaluation of ontological, epistemological, and axiological stances

Ontology

Ontology considers the conceptualisation and nature of reality (Guarino et al., 2009). In this project, the researcher assumed a critical realist position (Bhaskar, 2013) for their ontological and epistemological stances. A critical realism ontology proposes that "…there exists both an external world independently of human consciousness, and at the same time a dimension which includes our socially determined knowledge about reality" (Dannermark et al., 2002, p.6). A critical realist conceptualisation of reality is often described through an iceberg analogy. This describes reality as three distinct levels (Fletcher, 2017); empirical (observable events and human interpretation), actual (events occur regardless of being observed) and real (causal mechanisms which influence events/outcomes). Considered to be a middle ground for researchers (Deforge & Shaw 2021), critical realism positions itself between positivism and constructivism/subjectivism (Taylor, 2018), acknowledging that

whilst an important aspect, human knowledge forms only one part of a wider reality (Fletcher, 2017).

Whilst aspects of this research may lend itself to a social constructivist stance, due to explorations into participant realities, adopting this stance can be limiting by preventing researchers from discerning between possible ideology, and a genuine reality (Cruickshank, 2011). Therefore, a critical realist stance was considered most appropriate for this research. Adopting this middle ground has particular relevance for educational psychologists (EPs) given that this stance allows EPs to consider a multitude of complex contexts (including educational and social) which then "…facilitates highly reasoned, reflective and coherent actions in bringing about positive change" (Kelly, 2008, p.22). This consideration of all contexts is particularly useful when exploring social problems (Fletcher, 2017), which better aligns with the context of this research.

Epistemology

Epistemology considers the nature of knowledge and the methods used to gather this information (Tuli, 2010). As previously discussed, critical realism positions itself around a multi-layered concept to reality. As critical realist researchers, our role is to discover these deep and casual mechanisms, "…asking what variety of causal relations must exist in order for the empirical events to occur" (Vincent & O'Mahoney, 2018, p. 6). Research highlights that there is minimal guidance around methodology for critical realists (Price & Martin, 2018), and instead, researchers should remain flexible to all quantitative and qualitative approaches, given that specific methods may lend themselves better to exploring different contexts (Vincent & O'Mahoney, 2018).

Critical realists must focus on exploring explanations for answers, as opposed to making predictions (Jeppesen, 2005). This further aligned with the researcher's axiological position of remaining an ethical and impartial researcher. This influenced their decision to conduct a literature review for Paper One and semi-structured interviews for Paper Two, which are both commonly used methodologies for critical realists (Price & Martin, 2018). This is due to these approaches allowing the researcher to remain open to potentially new knowledge

that was generated from the dataset. Critical realism argues that this approach is important, to ensure that research theories are continually adapted/revised in response to new sources of knowledge (Cruickshank, 2011).

Axiology

Axiology refers to the beliefs and values that we hold, including our ethical beliefs and how this governs our approaches to research (Cohen et al., 2018). As part of the researcher's role as a TEP, their values were underpinned by the need to conduct ethical research, adhering to the ethical guidelines of practitioner psychologists (Health and Care Professions Council, 2016). On a more personal level, it was important for the researcher to design a project which could support the development of positive futures for CYP, a key aspect of positive psychology practice (Kern et al., 2020) which the researcher is an advocate of. This helped to shape the design of the research, culminating in an implementation framework (Paper Two) to support practitioners.

The researcher's counselling background also informed their beliefs around capturing direct views of users/pupil voice, a key aspect of the United Nations (UN) Convention on the Rights of the Child (1989). This shaped the design of Paper One which focused on synthesising literature that explicitly reported views from users. Whilst it was not possible to capture the views of CYP directly in Paper Two (due to recruitment difficulties discussed previously), anecdotal views were collated via third party questions in the interview schedule and the researcher also explicitly referenced the need for future research to capture pupil voice. This helped to ensure that this research project provided a foundation to inform other studies, emphasising the continued importance of capturing pupil views.

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Paper One: User perspectives of robotic telepresence technology in schools: A systematic literature review

Prepared for in accordance with the author guidelines for submission to the 'Educational Psychology in Practice' journal (Appendix 1)

User perspectives of robotic telepresence technology in schools: A systematic literature review

Keywords

Telepresence; robotic avatar; user perspectives; emotional based school avoidance; physical/emotional health; schools

Abstract

There is a growth in the use of robotic telepresence technology, allowing users to remotely access an environment, to support the inclusion/attendance of school pupils experiencing physical/emotional difficulties in the UK. Educational psychologists (EPs) are likely to encounter robotic telepresence technology due to their role in supporting pupil inclusion. Despite the Department for Education exploring this technology as a form of alternative provision, there is a lack of research exploring perceptions around robotic telepresence technology. The current review explores perspectives of users. Database searches were conducted between July 2021 and September 2021, identifying studies published within the last ten years. Eleven papers met the inclusion criteria. The review identified four inductive themes: potential for robotic telepresence technology to promote inclusion; potential for robotic telepresence technology to facilitate engagement; technical design factors influencing utility; and acceptability of robotic telepresence technology to users. Findings are discussed alongside implications for educational psychologists/future research.

Introduction

School absence is a growing reality for many young people. Even excluding coronavirus-related absences, persistence absence rates have grown, resulting in the UK government pledging to explore ways to improve school attendance, in collaboration with experts (Department for Education, 2021a). Given such concerns around school absence, there have been increasing applications of the use of robotic telepresence technology (RTT) to support pupils accessing their education both internationally (Weibel et al., 2020) and within UK local authorities (No Isolation, 2021). Whilst primarily this technology has been used for

improving the attendance of young people with physical health needs (Chubb et al., 2021), research is beginning to explore the use of these devices to support other populations, such as those with emotional/mental health needs, for example, anxiety (No Isolation, 2021).

With the pivotal role that educational psychologists (EPs) can have in supporting pupils experiencing school attendance difficulties (Corcoran et al., 2022), there is a growing likelihood that EPs may interact with RTT when supporting schools. For example, UK local authorities are beginning to trial RTT (for example, SCC & No Isolation, n.d) in a systemic way. Given that a key aspect of the EP's role is working at systemic levels (Woods, 2016), they may be asked for support around the ethics of the device, how it could be implemented, and how they may support pupil inclusion. Whilst this highlights the importance of research to inform professionals about RTT, questions remain around whether this technology is positively received. The current systematic literature review (SLR), the first of its kind, fills that gap by exploring the literature that has examined the perspectives of users (pupils, parents, teaching staff) who have used/experienced RTT in education settings.

Defining telepresence

Draper (1995) proposed three contrasting definitions for telepresence which formed the basis for later research (Draper et al., 1998): Simple, Cybernetic and Experiential. 'Simple' focuses on a user's ability to access an environment through technology; 'cybernetic' focuses on the quality of the 'human-machine inter-face' and 'experiential' focuses on the state of mind of users, exploring whether they feel 'present' in an environment using technology.

Although definitions continue to be debated, telepresence technology use has increased in fields such as healthcare (Groom et al., 2021), education (Meyer, 2015; Yeung & Fells, 2005), and technology (Fadzli et al., 2020). Given that the current review focuses on telepresence in schools, the authors considered it pertinent to adopt an 'experiential' definition of telepresence, focusing on the impact of RTT to enable a user to feel physically present within their surroundings.

Telepresence in schools

The use of RTT is not a new phenomenon within education; research dates back to the turn of the century (Fels et al., 2001). However, what has developed in the last twenty years is exactly how the technology is used. For example, some education settings utilise the technology to facilitate the behaviour management and compliance of pupils (Fischer et al., 2019) by allowing psychologists to observe a child remotely, which is less obtrusive than a direct observation in person. Through the technology, psychologists can monitor the pupil, as well as any environmental impacts on their behaviour, which can then be discussed in school consultations. For others, the use of the technology has been that of a direct teaching tool, for example, delivering foreign language learning remotely (Liao & Lu, 2018). In the last decade, the use of the technology to facilitate social interaction (Kristoffersson et al., 2013) and support pupils who miss learning due to illness/hospitalisation (Yousif, 2021) has been explored. More advanced telepresence technology is helping to facilitate pupils to access both a school-based education, and social situations, despite being hospitalised/bed bound (Chubb et al., 2021).

Development of Robotic Telepresence

Despite more typical telepresence/video conferencing technologies such as computer tablets remaining in use (Meyer, 2015), robotic avatars that include integrated cameras, audio, and movement (Newhart & Olson, 2017; Yeung & Fells, 2005) are becoming more prominent. Research supports the benefits of this technology for maximising pupil connectedness and presence within the classroom (Page, Charteris, et al., 2021; Weibel et al., 2020). With governing UK bodies (Public Health England, 2021) highlighting the important role that education professionals have in supporting both children's learning and their emotional well-being, the use of RTT appears to fill a notable gap for pupils with low attendance and health needs.

Whilst specific designs of RTT continue to develop (Fitter et al., 2018), the core elements remain the same: technology that has audio and camera capabilities with some remote movement/form of control for the user (Kristoffersson et al., 2013; Page, Charteris, et al.,

2021; Velinov et al., 2021). The AV1 robot (Figure 1), for example, is a specific RTT device that formed part of the Department for Education's alternative provision project (No Isolation 2021). With this device, the young person connects via a computer tablet at home, and the robot sits in their classroom, live streaming the lesson. The pupil at home is then able to communicate and interact via the tablet by moving the robot, activating lights/digital expressions as well as verbally communicating through the built-in microphone.

Figure 1. Example of a RTT device: the AV1. Image by No Isolation (n.d.).

Rationale and Review Aims

Fletcher & Bond (2022) highlighted both the potential benefits of RTT and the growing use of this technology within the UK. Whilst there are existing international reviews around RTT in schools, these have focused on how the technology is used (Velinov et al., 2021) or its impact within specific countries (Page, Charteris, et al., 2021). Presently, there are no SLRs that synthesise the literature regarding perceptions of RTT. Thus, the aim of the present study is to fill that gap by exploring user perspectives of RTT in education settings, where it is used to support those unable to access their education due to experiencing physical or emotional health-related needs. Essentially, the researcher collated the literature to answer the following question:

'What are user perspectives about robotic telepresence technology in schools?'

Methodology

Review Process

This study utilised the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework (Page et al., 2021; Figure 2). Between July 2021-September 2021, literature searches were conducted across the following databases: PsychInfo, British Education Index, Web of Science, Education Resources Information Centre (ERIC), Technology Research Database, Internurse and British Nursing Index. Databases were searched using the terms: (Telepresenc* OR Teleconferenc* OR Videoconferenc*) AND (Robot* OR Avatar* OR AV1* OR Pebbles) AND (School* OR Classroom* OR Educat* OR Pupil* OR Child* OR Student*).

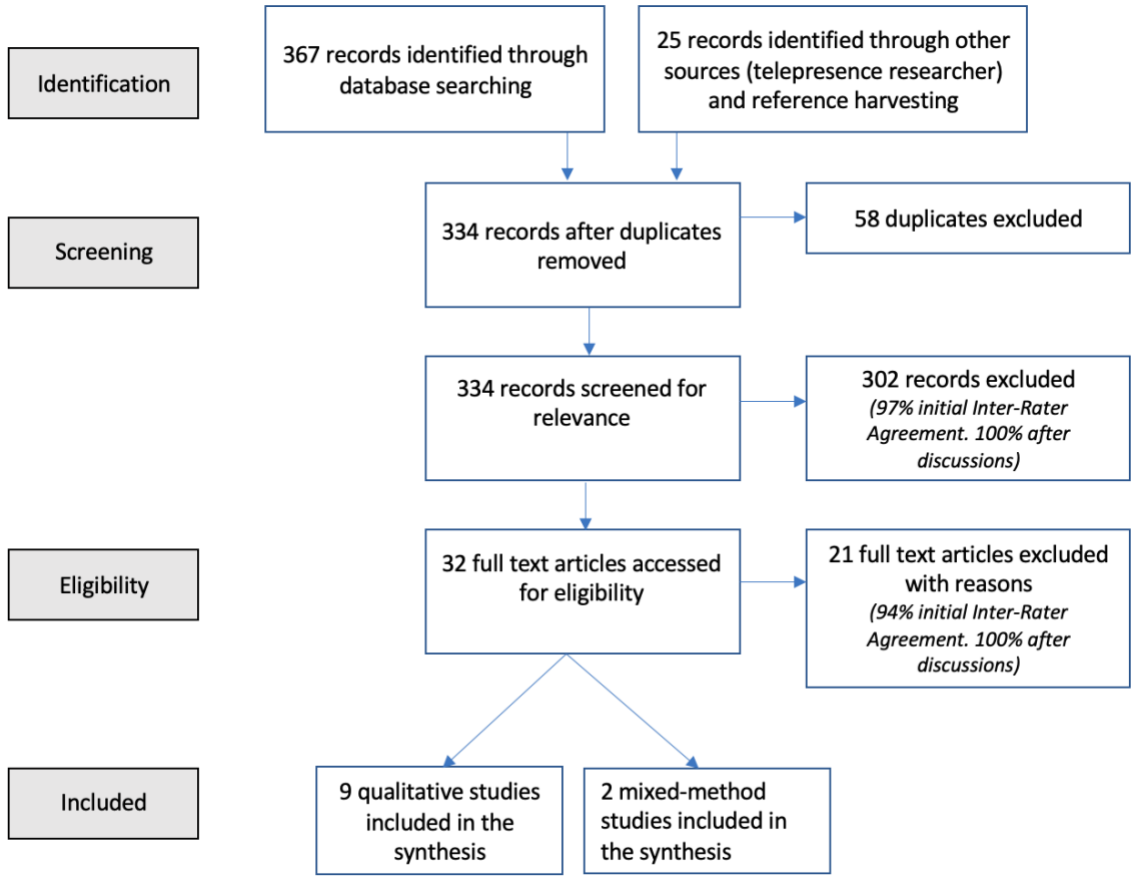

Figure 2. SLR process mapped to the PRISMA Framework.

Preliminary database searches found that some studies explicitly referenced commercial telepresence products (for example, AV1/Pebbles). Therefore, these terms were included in the search to maximise the number of papers found. Given this paper's adoption of the experiential definition (Draper 1995) of telepresence, coupled with the aim of specifically reviewing RTT, the second tier of search terms (for example, Robot*) was also included. To maximise the likelihood of reaching saturation when gathering papers, a research advisor for a leading telepresence company, No Isolation, was contacted as this company was commissioned by the Department for Education as part of their 'Alternative Provision Innovation Fund' project (Department for Education, 2021b). This yielded several international papers. Reference harvesting also identified additional papers missed during database searches.

Given that RTT is a relatively new field and minimal peer reviewed articles were found during searches, it was decided to include international grey literature (in any language) provided by the No Isolation research advisor. Whilst not formal, academic peer review, all grey literature included had been through some level of scrutiny (for example, approval by a hospital or reporting to a committee), suggesting some form of professional accountability in the findings. It was considered important to include this literature given that it would increase the breadth of this SLR but also help to provide an insight into conclusions about the technology from an international perspective.

Of the 334 studies identified, 302 were excluded (duplicates and irrelevant abstracts/titles). Thirty-two remaining papers were then screened using inclusion and exclusion criteria. The inclusion criteria were:

- Use of RTT to access learning due to illness/health/Social, Emotional and Mental Health (SEMH) reasons.
- Empirical research.
- RTT used with Primary to Secondary age range pupils (5-18).
- Published in the last 10 years (dataset/technology must be within this timeframe as well).

- Gathers direct views from users (for example, teachers, parents, pupils) and reports these via direct quotes or narrative description.

The exclusion criteria were:

- Technology is used to assist/deliver teaching for the whole class.
- Lab based or hypothetical research.
- Conference Paper/Meta-Analysis/Systematic reviews of other papers.
- Paper is more than 10 years old.
- Telepresence technology used for pupils aged 19+ or under 5 years old.

Following full text review (including inter-rater agreement between the researcher and supervisors), a further 21 papers were excluded (see Appendix 2 for a list of papers and reasons for inclusion/exclusion against the inclusion and exclusion criteria). Papers were excluded if they did not meet all aspects of the inclusion criteria or if they met an aspect of the exclusion criteria. Given the rapid developments within RTT, papers needed to be relatively recent to ensure these views were not outdated, hence the focus on the last 10 years. In total, 11 papers were put forward for a final quality assurance.

Quality Assurance of Research Papers

11 papers were reviewed using the University of Manchester Educational Psychology Critical Appraisal Qualitative Review Framework (Woods, 2020). Each paper was rated against 15 criteria which explored key aspects of research quality such as research design, data analysis, evidence of researcher reflexivity etc. A maximum rating of 20 could be achieved by each paper as some criteria attracted up to two points. Papers were coded as Low (0-6), Medium (7-14) or High (15-20) quality, based on their weight of evidence (WoE A) score (Gough, 2007). For the two-mixed methods papers, their qualitative framework scores were used as the quantitative information in these papers were reported descriptively, meaning they scored most highly on the qualitative framework (see Appendices 3 and 4 for a copy of the framework, a worked analysis example and list of WoE scores for each paper). Given the emerging field of RTT evaluation, low-quality papers were not excluded given the aim of the

review to gather user perspectives and inform future professional practice. The researcher, with agreement from their supervisors, concluded that no further WoE scoping was needed as the included papers sufficiently addressed the literature review question (LRQ).

Synthesis and Extraction

Included papers were analysed using thematic synthesis (Thomas & Harden, 2008). Studies were coded inductively, line-by-line, and codes were then synthesised into inductive descriptive themes (see Appendix 5 for an example of the thematic synthesis process). To ensure descriptive themes accurately reflected the findings of papers, the researcher discussed the coding and inductive themes with their supervisors, given their understanding and knowledge of the included papers.

Findings

Overview of Included Studies

Of the 11 included papers, four were from the USA, two from Norway, two from Denmark with single papers from New Zealand, the Netherlands, and Sweden. Five of the papers were provided by the telepresence researcher, in their original languages, therefore a free translation website was used to convert those papers to English. Table 1 provides an overview of the studies and details which papers required translation. One paper reported only teacher/guardian views (Henriks, 2017); all other papers directly reported views of pupils who had directly utilised RTT (referred to as 'pupils' in this review). All included papers reported views of various adults, including teachers, wider-school staff, and parents. The age of pupils utilising the technology ranged from 5 to 18 years. Some studies focused on reviewing the technology itself and others focused on the impact of the technology on pupils. However, they all report some form of views from users, which is the purpose of this SLR's analysis. Whilst several papers referenced explorations into the technology for emotional health reasons, for example anxiety, it is evident in all papers that, currently, RTT is largely used for supporting children with physical health needs.

Figure 3 provides an overview of the four inductive themes that were formed during the analysis of papers. Positive and negative user views are discussed under their corresponding themes, better reflecting the contrasting views of some of the studies.

Author/Year/ Location	Participants	Reason for Technology	Technology Used	Research focus	Design and Methodology	Findings	WoE*
Ahumada-Newhart & Eccles (2020). *USA*	5 children 5 parents 104 classmates	Physical Health	'VGo' Robot 'Double2' Robot	Explored: consequences of isolation for child development; use of RTT and design features facilitating learning	Qualitative: -Semi Structured Interviews -Focus Groups -Observations	• Robots important for social presence/engagement for most participants. • Limited robot mobility impacted on participation for several participants.	Medium
Ahumada-Newhart & Olson (2019). *USA*	11 children 16 parents/guardians 20 teachers 16 school administrators 44 classmates	Physical Health	'Double' Robot 'VGo' Robot	Explored: design features of robots and their impact on learning	Qualitative: -Semi Structured Interviews -Focus Groups -Observations	• Positive impact on lesson engagement, participation & social engagement through extracurricular clubs. • Concerns - battery life, Wi-Fi connectivity, mobility issues & 'social debt' due to the reliance on others.	Medium
Breivik (2017). *Norway*	2 children/young people 2 parents 1 teacher	Physical and Emotional Health	'AV1' Robot	Inclusion of students with ME and school refusal using RTT (Translated)	Qualitative: -Semi Structured Interviews -Observations	• Technology increased school engagement and social sense of belonging. • Concerns - connectivity, difficulties hearing the robot, school systemic challenges & possible unwanted attention	Medium

						for emotionally based school avoidant pupils.	
Chubb et al. (2021). *New Zealand*	5 children/young people 5 parents 5 teachers	Physical Health	360-degree remote camera	Participant experiences, perceptions of effectiveness, and recommendations for development of intervention	Qualitative: -Semi Structured Interviews	• Robot perceived as appealing. Promoted a sense of presence, engagement & social contact. • Some proposed developments regarding mobility of the robot, motion sickness and lack of two-way communication.	Medium
Henriks (2017). *Sweden*	1 child (views not reported) 1 parent/guardian 1 teacher	Physical Health	'AV1' Robot	To use experiences to inform further roll out of RTT in Stockholm (Translated)	Qualitative: -Semi Structured Interviews	• Positives - user interface, ease to use improved lesson engagement and social contact. • Difficulties - sound, connectivity, and lack of use.	Low
Johannessen & Haldar	37 children/parents	Physical Health	'AV1' Robot	To examine children's experiences with the communication robot,	Qualitative Design:	• Positives - reduced loneliness, user friendly interface,	Medium

(2020). *Norway*	32 school staff 6 health workers 3 charity representatives 19 robot company staff 12 classmates 3 City employees			AV1, in school (Translated)	-Semi Structured Interviews	• inclusion around learning, a 'safety net' for some users. • Challenges - connectivity, negative reminders of what pupils were missing, lack of school/parental support, inaccessibility for practical subjects & requirement for existing social groups.	
Kind & Ziekenhuis (2019). *Netherlands*	7 children 7 parents 3 teachers	Physical Health	'AV1' Robot	Influence of AV1 robot on social well-being of physically ill 6–18-year-olds who have difficulty attending school (Translated)	Mixed Methods: -Semi Structured Interviews -Survey	• Positives - increased school participation, decreased loneliness, evoking positive emotions and easy user interface. • Some difficulties relating to connectivity/sound and vision, lack of contribution to social life beyond school, reliance on existing social contacts, AV1 attracting attention.	Medium
Lister (2020). *USA*	1 child 1 teacher Minimum 16 classmates (unspecified number of "groups with 5-8 classmates").	Physical Health	'Beam Pro' Robot	Explored use of RTT in promoting inclusion normalcy, learners' perception of autonomy and socio-emotional engagement	Qualitative: -Semi Structured Interviews -Focus Groups	• Perceived to improve social connection, social normalcy, academic engagement, self-esteem, empowerment & autonomy. • Some criticisms of robot lack of movement and the time taken for some staff to adopt the robot.	Medium

Newhart et al. (2016). *USA*	5 children 5 parents 10 teachers 35 classmates 6 school/district administrators	Physical Health	'VGo' Robot	Explored classroom use of robot, its perceived effects and feasibility for homebound students, their teachers, and classmates	Qualitative: -Semi Structured Interviews -Focus Groups -Observations	• Some positives related to increased social connection/inclusion, reduced isolation, improved access to education, improved mood/energy and acceptance by staff/peers. • Concerns - one pupil felt bullied due to being treated differently. Connectivity and mobility issues and lack of school support for robot implementation.	Medium
Skubo (2020). *Denmark*	21 children	Physical Health	'AV1' Robot 'Fable Connect'	Evaluated children and young people's experiences with RTT throughout COVID-19. (Translated)	Mixed Methods: -Semi Structured Interviews -Survey	• Positives - improved social connection, inclusion, access to teaching, increased attendance, class presence. • Difficulties – Wi-Fi issues/unstable connection & speakers.	Medium
Weibel et al. (2020). *Denmark*	3 children 3 parents 2 teachers 15 classmates 4 healthcare professionals	Physical health	'AV1' Robot	Explored use of AV1 RTT to promote social and academic connectedness of school-aged children and adolescents with cancer	Qualitative: -Semi Structured Interviews -Focus Groups -Observations	• Positives - potential for improved inclusion, social connection & access to education. • Concerns - one pupil felt not included in class. Some set-up and unstable connectivity/Wi-Fi issues.	High

Table 1. Overview of Included Studies.

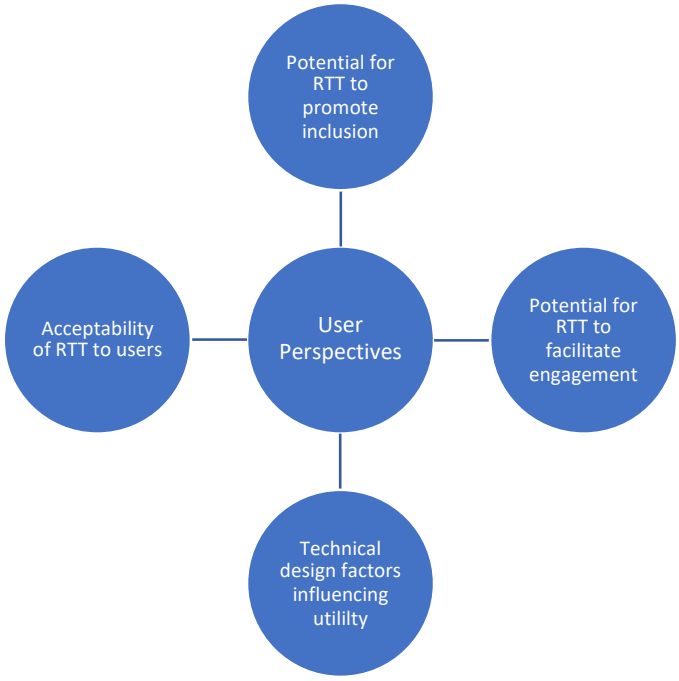

Figure 3. Overview of inductive themes.

Theme 1- Potential for RTT to promote inclusion

Explicit references to inclusion were reported by all papers. Reported benefits included lesson/education inclusion due to pupils accessing the same work via RTT (Breivik, 2017; Ahumada-Newhart & Eccles, 2020), social inclusion benefits due to pupils having contact with peers in the class/playground (Henriks, 2017) or a combination of both (Newhart et al., 2016; Ahumada-Newhart & Olson, 2019; Kind & Ziekenhuis, 2019; Johannessen & Haldar, 2020; Lister, 2020; Skubo, 2020; Weibel et al., 2020; Chubb et al., 2021). The consensus was generally positive in relation to inclusion, with six papers explicitly reporting a reduction in isolation of RTT pupils (Newhart et al., 2016; Kind & Ziekenhuis, 2019; Johannessen & Haldar, 2020; Lister, 2020; Skubo, 2020; Chubb et al., 2021).

Several papers did highlight isolated inclusion difficulties for consideration. One paper referenced how staff availability impacted on the set up and therefore the frequency of RTT use within a setting (Henriks, 2017). Two other papers noted that the technology did not

create social inclusion because it required pupils to already have existing social contacts/groups to interact with (Kind & Ziekenhuis, 2019; Johannessen & Haldar, 2020). Henriks (2017) noted positive effects relating to newfound attention from using the device, this was referred to as “red carpet syndrome”. However, some pupils in other papers did not like the attention they were receiving due to using a robot (Kind & Ziekenhuis, 2019; Johannessen & Haldar, 2020), even resulting in one pupil returning the technology due to this negative response (Newhart et al., 2016). Concerns relating to unwanted attention led to some staff believing the technology would not be beneficial for pupils who demonstrated emotionally based school avoidance (EBSA) (Breivik, 2017). However, whilst Johannessen and Haldar (2020) found similar views from staff relating to concerns around the applications of the technology for EBSA cases, they noted that one pupil experiencing EBSA used the technology, with the parent concluding that it was showing positive results for their child.

Theme 2- Potential for RTT to facilitate engagement

In addition to a sense of inclusion/presence within schools, all 11 papers highlighted positive views relating to RTT supporting pupils in actively engaging with their learning. Papers referenced improvements in pupil self-esteem and confidence, which in turn increased pupils’ desire to actively engage with their education via the technology (Newhart et al., 2016; Kind & Ziekenhuis, 2019; Lister, 2020; Chubb et al., 2021). Other participants highlighted the use of the technology to facilitate social engagement via extra-curricular activities and school trips (Ahumada-Newhart & Olson, 2019; Kind & Ziekenhuis, 2019; Lister, 2020). One paper (Johannessen & Haldar, 2020) elaborated on why the technology facilitated engagement, with one parent referring to the technology as a ‘low-threshold, safety net’ given that it requires minimum effort for pupils to engage in their education. This was reported to better accommodate those whose health may suddenly deteriorate and require last-minute use of the technology.

When the RTT did not show the pupil at home (that is, one-way video), pupils said they felt protected due to not having to show their illness to peers; this then motivated them to engage with the technology and their education (Johannessen & Haldar, 2020; Chubb et al.,

2021). Conversely, in one paper where the RTT allowed peers to see the pupil via a screen, it was reported that this was unpleasant for school staff/peers seeing the pupil unwell (Ahumada-Newhart & Olson, 2019). However, in two papers where telepresence equipment utilised one-way video (where schools could not see the pupil), pupils using the device expressed a desire to be seen on screen (Henriks, 2017; Kind & Ziekenhuis, 2019), indicating mixed views across the papers regarding the pros/cons of having two-way video capabilities.

Theme 3- Technical design factors influencing utility

Four papers highlighted positive staff and pupil views relating to the design of the RTT. These papers praised the user-friendly/popularity of a robotic design and the simple user-interface (Henriks, 2017; Kind & Ziekenhuis, 2019; Johannessen & Haldar, 2020; Chubb et al., 2021).

However, all 11 papers reported examples of the RTT experiencing some form of connectivity issue within the setting. Papers referred specifically to connecting to the Internet/Wi-Fi (Johannessen & Haldar, 2020; Weibel et al., 2020), visual/sound/mobility problems (Lister, 2020; Chubb et al., 2021), or a combination of difficulties listed above (Newhart et al., 2016; Breivik, 2017; Henriks, 2017; Ahumada-Newhart & Olson, 2019; Kind & Ziekenhuis, 2019; Ahumada-Newhart & Eccles, 2020; Skubo, 2020). The adverse effects of connection difficulties were evident in the papers, which highlighted the detrimental impact that technological limitations can have, such as further exacerbating pupil exclusion (Ahumada-Newhart & Eccles, 2020; Weibel et al., 2020) or worsening existing health needs for example, tiredness (Johannessen & Haldar, 2020).

Two papers highlighted views around the design of their specific RTT and how it adversely impacted its ability to be used in practical subjects, for example, sport or music (Johannessen & Haldar, 2020; Skubo, 2020). Three other papers referred to the technology creating a form of 'social debt' between the pupil and their peers, given the reliance on peers to position the technology in the room/transfer it to different classes (Newhart & Olsen, 2019; Newhart & Eccles, 2020; Weibel et al., 2020). However, one paper explicitly contrasted with those findings, noting that their specific robot had movement capabilities,

meaning there was no reliance on peers to move the robot around, increasing independence of its user (Lister, 2020).

Theme 4- Acceptability of RTT to users

Seven papers grouped multiple views in their conclusion, reporting a generally positive acceptance by users that included the classmates, teachers, pupils and parents. One paper emphasised the positive acceptance of the technology from the pupils themselves (Kind & Ziekenhuis, 2019). Five papers explicitly reported positive acceptance of the technology from class teachers, parents, and/or classmates (Newhart et al., 2016; Henriks, 2017; Breivik, 2017; Lister, 2020; Weibel et al., 2020). Whilst some areas of development were proposed (e.g., adjustments for motion sickness), one paper still unanimously concluded positive acceptance of the technology from all user perspectives (Chubb et al., 2021).

Whilst most papers were positive about the acceptance of the technology, there were individual examples of mixed reactions. Johannessen and Haldar (2020) found some staff accepted the robots and were keen to promote their use, but others were sceptical of the technology due to confusing IT and concerns around privacy. In Newhart et al. (2016), a pupil was forced to move school districts due to a lack of support from their current district around the use of the robots and reported bullying from peers, whilst Lister (2020) noted some 'unfamiliar adults' or peers in classes who did not know the user of the technology were less accepting of it.

Mixed acceptance of the technology appeared strongly linked to information sharing. Seven papers suggested that information sharing was pivotal for the improvement of RTT acceptance. Breivik (2017) found that most participants reported the need for sharing information around the RTT given that the barrier of acceptance often related to misconceptions about the technology. One paper described initial scepticism around the robots (Lister, 2020), but the authors also found that, with time and increased use of the robot, it was better accepted by peers and teachers. Five further papers shared a similar viewpoint, concluding that successful acceptance and implementation of RTT required more

sharing of information, support, and guidance for users (Johannessen & Haldar, 2020; Newhart et al., 2016; Kind & Ziekenhuis, 2019; Skubo, 2020; Weibel et al., 2020).

Discussion

The present review aimed to answer the LRQ, 'What are user perspectives about robotic telepresence technology in schools?'. What is apparent from this SLR is the generally positive perception of the use of RTT in schools. Consistent with findings of other reviews (Page, Charteris et al., 2021; Velinov et al., 2021), this SLR highlights the positive views and impact that RTT can have in supporting both social inclusion and academic engagement of pupils. Unlike other reviews in this area, the authors moved past existing scoping reviews to provide the first SLR of its kind, a notable gap identified in RTT research (Page, Charteris, et al., 2021). Whilst research is growing in this area, much work remains to be done, evidenced by the small number of papers within this SLR, the large variety of RTT in use (seven variations were identified), and variation in research quality. Similarly, the small number of participants within the available papers highlights both the limited scope of research within this field and also an additional barrier to making generalisable conclusions about RTT currently. Moreover, future investigations are required before conclusions can be made, to further explore some of the user comments relating to possible bullying, concerns around security, and questions about whom the devices can be used with.

Despite these considerations limiting the ability to form generalised conclusions, what is promising, however, is both the positive reception and potential this technology can bring in supporting specific pupil populations. Users highlighted the benefits of RTT in supporting both academic engagement and social inclusion/presence in education settings, with suggestions for improvement of some technical aspects. This is important, as for interventions to be adopted, they need to be perceived as acceptable and relevant to perceived need (Daniel & Lemons, 2018).

Implications for Professional Practice

Given the crucial role that both teaching staff (Farmer et al., 2019; Juvonen et al., 2019) and EPs (Farrell et al., 2006) play in promoting and facilitating inclusion, there is an evident need for professionals to explore all forms of inclusive provision, including via RTT. With research highlighting that pupils who experience long term/chronic illnesses are most at risk of receiving insufficient school support to promote engagement (Lum et al., 2019), alternative means of engagement should be considered. Whilst the present SLR identified a current dearth in research, there remain promising conclusions from users around this technology.

Given the capacity for EPs to work across individual, group and systemic levels, they are best placed to explore the value and potentiality of RTT within settings. Whilst the findings highlight the largely common use for RTT with pupils who have physical health needs, there were examples around trialling the device for emotional based needs such as EBSA. With EPs being best placed to support schools with EBSA (Corcoran et al., 2022), all avenues of support, including RTT must be considered. With pupil exposure to the classroom environment (Elliot & Place, 2019) having been identified as one element of EBSA intervention, RTT could have wide-spread benefits for supporting pupil populations like those experiencing emotional-related attendance problems. If RTT has the potential for promoting more inclusive practice within UK schools (Fletcher & Bond, 2022), EPs are well placed to support the development of a UK evidence base.

Implications for Research

In this SLR, only one paper was assessed to be “high quality”. Given the exploratory nature of this review, it was important to be able to draw on the insights from studies across the research quality spectrum (Dixon-Woods et al., 2006). However, as this field develops, there will be a need for high quality research demonstrating effectiveness. Many of the included studies promoted the need for larger sample sizes to improve research quality, however this may not be possible in this field due to the individualised use of the technology. However, data saturation can be reached with small sample sizes (Hennink & Kaiser, 2021) and higher-quality small scale research (for example, through standardised measures/mixed methods

implementation), which may better represent participant populations or experiences (Young & Casey, 2019).

This paper was the first of its kind to collate user perspectives and report inductive themes about their experiences of RTT, helping to explore the general consensus of this technology in schools. However, there were considerable differences in robots used, ranging from those with completely independent mobility/wheels (for example, VGo) to those that were static with only reduced movement (for example, AV1). Whilst the limited volume of papers prohibited in-depth comparisons between user groups, coupled with the fact that many papers grouped user views together and did not attribute these to specific individuals, for example, teachers/pupils/parents, future studies could focus on reviewing specific devices and specific groups of user views, for example, teachers or pupils demonstrating EBSA, to understand the features which are most important for effectiveness.

It is also important to consider that no UK-based papers were identified in this review. Given that there are increasing examples of local authorities using such devices, there is an evident gap in UK based, academic research around their use. Whilst this paper is the first of its kind to collate papers to inform UK based practice, it is evident that future studies should explore the use of the devices within the UK, capturing user views and considering its applications within a UK context.

Limitations of the Review

Unlike many other SLRs, this review included findings from selected grey literature. Including grey literature in SLRs has been found to be beneficial (Mahood et al., 2014) and in this SLR, it facilitated a more comprehensive overview (Paez, 2017) and was unlikely to have adversely affected the quality of the review, given that the majority of grey literature papers scored consistently with other peer-reviewed papers. However, it is also important to acknowledge that several papers required translation. Whilst translation raises a potential limitation, given that the authors were reliant on translating papers through an online software, user views within these papers were consistent with the findings of the papers written in English. Given that all papers (both English and translated) had the same recurring

themes, translation has likely unaffected the quality of the review and instead, has further supported this review in reaching 'conceptual saturation' (Thomas & Harden 2008).

Conclusion

This SLR filled a gap in research by synthesising the findings of papers that explored user perspectives relating to the use of RTT in schools. It highlights the largely positive views of the technology for improving academic engagement, learning, and reducing social isolation/loneliness. Key barriers relate to IT difficulties such as Wi-Fi, and the impact of misconceptions and minimal information sharing amongst users. Considerations for future practice highlight both the integral role that EPs can have in exploring RTT as a form of provision, alongside the need for further high-quality research in this field.

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Paper Two: Using AV1 robots to support pupils with physical and emotional health needs

Prepared for in accordance with the author guidelines for submission to the 'Educational Psychology in Practice' journal (Appendix 1). See Appendix 6 for supporting letter.

Using AV1 robots to support pupils with physical and emotional health needs

Key Words

AV1; telepresence; robotic avatar; schools; perspectives; physical/emotional health

Abstract

The AV1 robotic device has a growing evidence base, both internationally and in the UK, for supporting pupils with physical/emotional health needs. The device allows pupils to access their school lessons remotely through telepresence technology. Previous papers have highlighted the growing relevance to the education field, although, to date, there is no published UK academic research. In consideration of this, the purpose of the present paper was to explore the views of school staff who have trialled the AV1 device in the UK. Semi-structured interviews were held with ten staff members from different school settings before data were analysed thematically. Key themes related to potential for impact, opportunities/challenges, and wider socio-economic considerations. Implications are considered in relation to (1) future research and professional practice, and (2) the introduction of a proposed implementation framework to support practitioners when trialling the AV1.

Introduction

The use of telepresence robots (TR) to support children and young people (CYP) accessing their education has grown in recent years. UK (Fletcher et al., 2023) and international (Page et al., 2021) reviews highlight their growing popularity, particularly to support a variety of physical and emotional health related needs, with CYP connecting to educational settings remotely via a robot and computer tablet. One prominent type of TR in use is the AV1 (Figure 4). In the UK alone, over 750 AV1s have been in circulation in the last two years, across 45 local authorities (LAs), following commissioning from the Department for Education (No Isolation, 2021).

Figure 4. The AV1 avatar. Image by Johnsrud & No Isolation (n.d).

Given this exponential growth of AV1s across LAs, support professionals, such as educational psychologists (EPs), are increasingly likely to encounter these devices in their role (Fletcher et al., 2023) due to their application for CYP experiencing medical needs, anxiety, and emotionally based school avoidance (EBSA) (No Isolation, n.d). Whilst devices like the AV1 are in circulation throughout the UK, there is a lack of UK-based, academic research that evaluates their use. LA reports are emerging (SCC & No Isolation, n.d), but broader UK research is needed to inform professionals who may interact with the AV1. This research paper fills that gap, providing the first UK-based research paper exploring the use of AV1s to support pupils with physical and emotional health needs in the UK[1].

The AV1

Created by the Norwegian company, No Isolation, the AV1 robot allows CYP who are hospitalised/at home, to connect with their school setting via a computer tablet. The robot sits in the young person's seat in their class, allowing them to communicate with peers/adults (Johannessen et al., 2022) via 360^{o} movement, a microphone, and range of lights/digital expressions. Unlike other robots available, the AV1 provides one-way video only, allowing the young person to watch a live stream of their classroom, without

[1] Please note that whilst No Isolation supported this research project (e.g., sharing recruitment materials), they did not have a direct relationship/oversight of the research project and analysis. The AV1 was chosen to be the focus of this research project given that this is the most popular device in use across UK schools.

staff/peers being able to see the young person's face, as they may desire privacy due to their health needs. Research into robot designs shows that, compared to its market counterparts, the AV1 was well received by CYP due to its practical design, variety of functions, and accessibility (Søraa et al., 2021).

The AV1 robot appears to best align with Draper's (1995) definition of telepresence, where technology allows a user to feel present within an environment without being physically present. Growing media interest into the AV1, both internationally (Børsting et al., 2019) and in the UK (BBC News, 2019) highlights the apparent awareness of the AV1 as a possible tool for support. In the UK, teaching articles (Hazell, 2018) are disseminating information about the devices to schools, emphasising both the prominence and growing popularity of these devices within the UK education system.

Applications and Impact

Originally designed and piloted in university research for supporting physical health needs (Børsting & Culén, 2016), the application of the AV1 has evolved. The device is now used for a range of health needs, acting as an alternative education provision for pupils experiencing physical illnesses such as cancer (Weibel et al., 2020), or as an individualised intervention for pupils experiencing emotional health needs such as EBSA (Johannessen et al., 2022) where the device forms part of an eventual return to school transition (Johannessen & Haldar, 2020). From a recent UK LA report, the leading use for the AV1 is to support pupils with mental health related needs such as EBSA (Figure 5), emphasising this shift in its application.

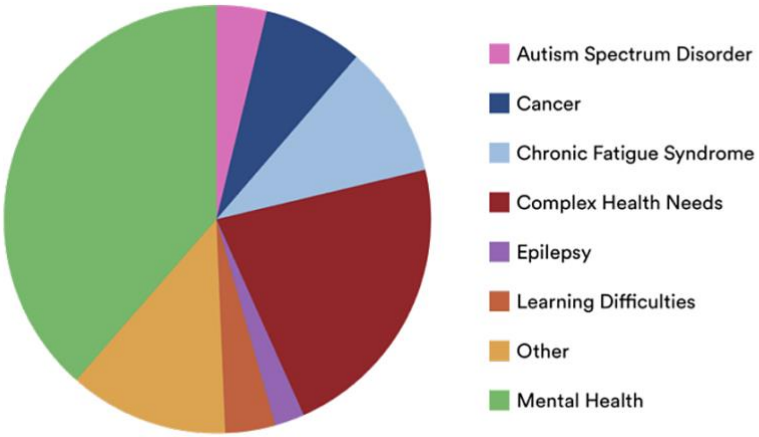

Figure 5. The use of the AV1 in Somerset, a LA piloting their use.

Note. This figure was produced by Somerset County Council and No Isolation in 2022, illustrating the most popular applications of the AV1 within Somerset. From: "What is AV1 used for?", by No Isolation, 2022, https://www.noisolation.com/news/somerset-county-council-report. Copyright 2022 by No Isolation.

International findings indicate that the technology has promising use in supporting pupils with a variety of health-related needs due to providing access to education and social contact, thereby reducing the likelihood of pupil loneliness (No Isolation, n.d). There is a current dearth of UK academic research, but findings from the Department for Education research project highlighted that 75% of pupils who used an AV1 increased their school attendance and showed improved engagement, self-esteem, relationships with staff/peers and emotional well-being (No Isolation, 2021). Similarly, a LA report concluded that in a project with 93 pupils using the AV1, 76% found that the AV1 positively impacted school attendance (SCC & No Isolation, n.d).

However, research to date is not entirely conclusive. For example, Johannessen et al. (2022) found that some participants reported either mixed or negative experiences of using the AV1; severity of the user's health, lack of support from others, technical considerations or school approaches to implementation affected user experience. Several of these themes were also evident in a recent systematic literature review of robotic telepresence technology (Fletcher et al., 2023). Such challenges must be acknowledged, given the intended purpose of the AV1 is to support pupils with a range of health needs.

Implementation and AV1

One explanation for these current, mixed findings, could relate to implementation processes, as similarly reported by Johannessen et al. (2022). Implementation science promotes the importance of acknowledging local and community level, ecological factors that can influence implementation success, alongside other key factors such as the

importance of training and technology-related assistance (Durlak & DuPre, 2008). This is particularly relevant for the AV1 given that it is conceptualised as an assistive technology tool (Johannessen et al., 2022). Another area to consider is the importance of social validity. Whilst often under-represented in literature (Miramontes et al., 2011), social validity is an important area to consider given that implementation success/positive outcomes have been explicitly linked to staff confidence and belief that an intervention will positively impact on child outcomes such as attainment (Daniel & Lemons, 2018). If exploring the impact of AV1s, this information highlights that the impact of implementation factors must also be considered.

The difficulty with implementation science, however, is that much of the research relates to universal level implementation, as opposed to group/individual level (Evans & Bond, 2021), which may not reflect the personalised use of the AV1. The AV1 device would likely be considered a Tier 3 form of intervention (Majeika et al., 2020), given its specialist use for individual pupils who are experiencing intense, day-to-day difficulties (Franklin et al., 2012; Suldo et al., 2019) and require provision/resources that are "…beyond the scope of general education" (Sterrett et al., 2020, p. 134). What separates Tier 3 levels of intervention from more universal forms of support (Tier 1), is the need for vertical or horizontal adaptations. This refers to adapting an intervention, both prior to delivery (horizontal) or during/afterwards implementation (vertical), to accommodate contextual factors/individual user needs, without detrimentally affecting the core principles of the intervention itself (Sterrett et al., 2020). Considering this, universal-level implementation factors may not fully reflect the context of more specialist interventions like the AV1, an issue that has been highlighted in research around other interventions, such as Lego®-Based Therapy (Evans & Bond, 2021).

Currently, existing international publications about the AV1 argue the need for further case studies and research to increase its evidence base (Johannessen et al., 2022; Weibel et al., 2020). Some universal level implementation factors are being tentatively linked to the AV1, such as a lack of support from other professionals (Johannessen et al., 2022), the requirement for staff training around the technology (Weibel et al., 2020) or the impact of government policy/legislation around privacy laws (Børsting et al., 2019). However, the

dearth of UK-based AV1 research suggests that there are likely to be AV1 specific implementation factors that have not yet been identified or are not reflected in universal level implementation science.

Many complex interventions require more time and research before implementation theory can be fully integrated into their evaluation processes (Durlak & DuPre, 2008). This is acknowledged in other fields, such as medicine, where 'adoption and assimilation' have been identified as distinct areas for professionals to consider but only after feedback and further information has been gathered first (Greenhalgh et al., 2008). Whilst this suggests that AV1 research remains in its infancy in the UK, implementation factors are still important to identify in order to develop more sophisticated evaluation methods. Collecting implementation data in tandem with evaluation outcomes is still considered to be important to explore the relationship between implementation and outcomes (Durlak & DuPre, 2008). Consequently, in order to fully explore the implementation of the AV1 and its influencing factors, broader UK research about the devices is required first alongside the collection of preliminary implementation information/factors.

Rationale and Research Aims

The research above highlights the complex nature of AV1 use but also identifies the potential, promising impact of the AV1 device to support CYP with health-related needs. Whilst there is growing international research, there remains a UK gap and a requirement for considerations around implementation barriers and how this may inform future research. Despite the Department for Education funding projects with these devices (No Isolation, 2021), there is limited evaluation of their effectiveness (SCC & No Isolation, n.d). Given the lack of UK research and the potential impact of implementation factors upon effectiveness, further research into the AV1s as a form of alternative education provision/intervention is warranted. This would also assist professionals, such as EPs, working with schools to implement AV1s (Fletcher et al., 2023). Consequently, the aim of the current research paper was to answer the following question:

'What is the perceived utility and impact of the AV1 on key child outcomes such as attendance, attainment and emotional well-being in UK schools?'

Methodology

Design

The present study adopted an exploratory qualitative research design which aimed to capture the unique experiences of school staff who had utilised the AV1s. Given the lack of research in the field, an opened-ended approach enabled us to be flexible and guided by participant perspectives (Busetto et al., 2020). We, thus, captured the lived experiences of participants, both positive and/or negative (Willig & Rogers, 2017).

Sampling and Participant Recruitment

Purposive sampling was used to recruit school staff with direct experiences/interactions with the AV1 robot (Etikan et al., 2016). We attempted to recruit from across the UK to gain a breadth of experiences however responses were only received from settings in England. Introductory emails (Appendix 7) were disseminated through contacts in multiple LAs; schools that had participated in UK news broadcasts about the AV1 were contacted, and a staff member at No Isolation, shared the researcher's introductory email to their own school contacts throughout the UK.

In total, ten participants were recruited (Table 2), across ten different schools in England.

Participant	School Setting	School Age Range	Role	Area
A	Secondary	11-18 years	SENDCo	South East
B	Post-16	16-18 years	Teaching Assistant	North West
C	Junior	7-11 years	Class Teacher	South East
D	Primary	4-11 years	Head of School	Midlands
E	Secondary	11-18 years	SENDCo	South West
F	Primary	4-11 years	SENDCo	Midlands
G	Secondary	11-18 years	SENDCo	South West
H	Alternative Provision	3-19 years	Headteacher	South West
I	Primary	4-11 years	Class Teacher	East

J	Primary	4-11 years	Class Teacher	South East

Table 2. Overview of Participants.

Data Gathering

Semi-structured interviews (SSIs) were used to maximise participation and gather the unique experiences of participants (Willig & Rogers, 2017). An interview schedule (Appendix 8) was designed to provide structure and prompts for participants, ensuring rich, detailed information was captured (Bearman, 2019). The interview schedule was emailed to participants in advance, providing them with time to reflect on their experiences, reducing the likelihood of participant anxiety around the contents of the interview (Bearman, 2019). To further maximise access, participants were interviewed online; interviews typically ranged between 30-50 minutes.

Ethics

Ethical approval was given by the University of Manchester on 10/01/2022 (see Appendix 9 for ethical approval document). All consent forms/information sheets (Appendices 10 & 11) were sent to participants in advance; signposting to external professional services was also provided, should participants have felt emotionally triggered discussing the sensitive application of the AV1 for supporting pupils' health needs.

Data Analysis

Thematic analysis provided a systematic process to thoroughly analyse and interpret participant experiences (Boyatzis, 1998). Braun and Clarke's reflexive thematic analysis (RTA) approach was used (Braun & Clarke, 2022) because it aligned with our aim of interpreting, synthesising, and reporting themes relating to the experiences of participants interacting with the AV1 (see Appendix 12 for an outline of the researcher's RTA process). Data were analysed inductively and collaboratively, where we discussed codes/data of interest between the researcher and supervisors, informing reflections and developing a richer and more nuanced review of the data (Braun & Clarke, 2019).

Findings

Use of the AV1 varied greatly amongst participants, with some referring to one pupil who had used the device, whilst others referenced multiple pupils. Whilst specific numbers have not been attributed to each participant to preserve anonymity, a summary is provided here. In total, staff referred to approximately 37 different pupils who had used an AV1. 17 pupils had used the AV1 for physical health reasons e.g., cancer, whilst 20 pupils had used the device for emotionally based reasons which typically related to either generalised anxiety or EBSA. Of the ten schools represented in the research, six schools had used the AV1 solely for physical health reasons, two schools solely for emotionally based reasons and two schools for a combination of both physical and emotionally related reasons. Figure 6 presents the three generated themes and subsequent sub-themes that informed the following findings.

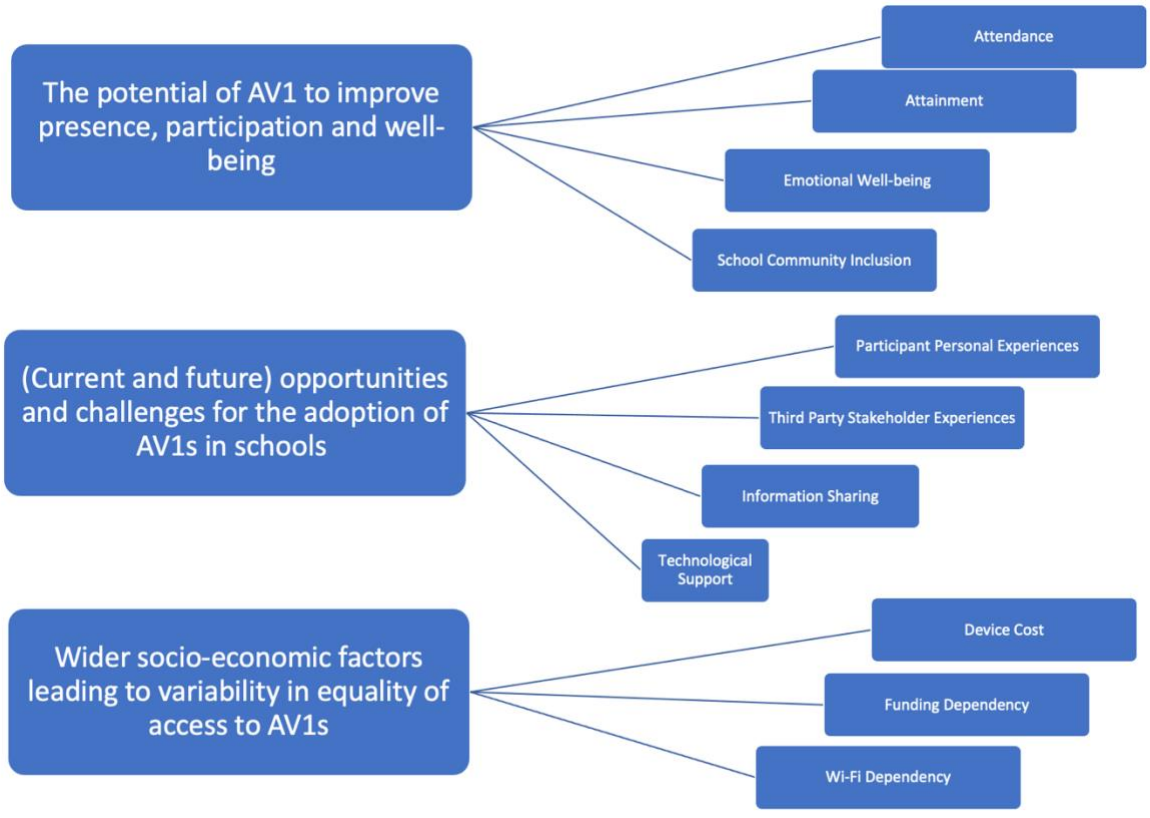

Figure 6. Thematic map of themes and sub-themes.

Theme One- The potential of AV1 to improve presence, participation and well-being

The majority of participants praised the AV1 as a tool for improving **attendance** of pupils given its ability to enable children to access their education remotely. Improved attendance related to both attendance within the classroom but also social situations such as playtime.

> "They had reduced …. their timetable to about 25% of their lessons. They're now back into all [lessons] bar PE… we're looking at almost a full timetable of lessons …and they're going to sit all their GCSEs. So that has been a huge impact for them" (Participant G).

One participant felt the AV1 did not support attendance but commented that this was due to other difficulties for the young person (existing anxiety) as opposed to being a fault of the device itself. Several other participants (who used the AV1 with multiple children) reported a concern from older pupils.

> "…if the robot is sat in school instead of me that highlights I'm not there and that highlights well, why aren't I there? [referring to views of a pupil]. And I can't cope with that, that makes my anxiety even worse" (Participant J).

Most participants commented that the AV1 assisted with pupil **attainment** due to the device supporting their ability to continue with the mainstream curriculum.

> "…it's [AV1] allowed their attainment to continue to move forward" (Participant G).

However, a number of participants reported that the device was still at an early stage of implementation.

> "I'd say for some we hope that it helps with their attainment, but I wouldn't necessarily say that's something that I can measure yet" (Participant E).

A further example was given of how there were difficulties monitoring attainment in Maths, given that these types of lessons required continual feedback/monitoring of

formulae/approaches used, something that was more difficult to monitor due to the pupil being at home.

Participants additionally referenced the benefits of the AV1 for supporting **emotional well-being** needs. Benefits included improved self-esteem and confidence due to pupils contributing to lessons from the safety of their own home or pupils having a sense of control over their situation due to being in control of the AV1.

> "…it definitely built some self-esteem …. they're a lot more confident and I do think it developed a sort of grit/determination side in them" (Participant J).

This was particularly important for pupils experiencing physical health needs, such as cancer, where the AV1 provided them with a form of control when they did not have full grasp of their health. Other participants identified the device provided pupils with stability and routine despite their health needs, whilst others emphasised the device supported pupils with feeling safe, specifically for those who may have felt unable to leave their home for emotional-based reasons.

> "I think it gives them a bit of control …..if they get to that point where they don't want to carry on in that lesson or they're too tired, they just go off, so I think again, for some of the children with really gruelling medical conditions, they haven't got any control in their lives…and for that, giving them a little bit of control is quite nice" (Participant H).

Participants explicitly referenced how the AV1 supported pupils with remaining a **part of the school community**. This not only included access to day-to-day lessons but also access to social contacts and friendships within school.

> "They are still, you know, part of the school day, they're following the same routines, the same lessons, so they're staying connected in that way" (Participant A).

One unique example was given of AV1 use enabling a pupil to attend the school Christmas pantomime. This continued access to the school community was perceived to facilitate an easier transition back into school as pupils felt that they hadn't been away from the environment, something that was shared by several participants. The importance of promoting links to the school community was attributed by one participant to the leadership team and the need for a 'top down' approach to promoting inclusion.

> "The fact that they are keeping involved and keeping in touch with their friends, I think is brilliant, because for any child not being in school…they are going to form some kind of an anxiety about coming back…so just to keep them linked in place, I think it's great" (Participant F).

Staff reported that some parents were extremely positive about the AV1 enabling their child's ongoing inclusion within the school community. A few participants shared, however, that social contact was not consistently a positive for AV1 users. Several pupils found it a reminder of what they were missing in school.

> "It allowed the child to have access, but their friendships were not the same level as friendships in person. And quite often, …. they would listen to what the other children had done rather than be able to sort of share things that had happened to them because actually, they hadn't really done anything because they weren't going anywhere" (Participant I).

Theme Two- (Current and future) opportunities and challenges for the adoption of AV1s in schools

The general consensus around the AV1 was extremely positive from the **personal perspectives/experiences of participants**. Participants praised the technology as a tool for bridging contact between home and school for pupils who were unable to attend school physically. All participants stated that they would recommend the AV1 device to other schools/professionals.

> "I think …. it's a great tool and it's a great resource for students who physically can't be in school to feel a part of the school and a part of the community, part of the classroom, it helps the students in the classroom to remember that there's another student at home… they can physically talk to them… it's, again, more personable for the whole class really" (Participant B).

> "I just think…. it's an amazing technology…the more we embraced it in the classroom, the more we got from it and the more the child was able to get from it as well" (Participant I).

A small number of participants reported **third-party (i.e., other staff members) experiences** of the device increasing workload e.g., preparing worksheets that would be sent home for the pupil.

> "I think the view from some members of staff is it's a lot of extra work in that I would upload the slides and work onto Google classroom. And it's just another layer of thinking that sometimes you just don't have capacity for. I know some teachers' views were yeah, it's great for the pupil but also it's adding more to our workload" (Participant C).

Added workload also related to the co-ordination time needed to implement the device within a school. However, most participants reported that staff were largely positive around the use of the AV1 due its positive impact on pupil well-being, engagement, and positive reactions from parents. Acceptance of the device was strongly linked to teachers adapting to the device over time.

> "…we haven't had a single teacher that's not wanted to have it. Teachers have probably had more questions…that it's not recording, it's just a livestream…they've all been really positive. And they want to be able to help the children learn however they can help them so they're happy to facilitate whatever method that might be so yeah, teachers have been really good about it" (Participant E).

Overcoming potential challenges of the AV1 (e.g., staff acceptance) was largely linked to the importance of **preparation and information sharing**. This included alleviating staff concerns around privacy and data protection by disseminating information about the AV1's security/encryption.

> "I sent some emails round – whole staff emails – as did the head teacher and I think once the realisation came in that …. there are very tight consent forms and regulations around it…that's when everybody's attitude changed" (Participant F).

Similarly, information sharing alleviated parental concerns by keeping them informed about the process/benefits of the device. When concerns related to technology related difficulties such as how to use the device, nearly all participants praised the **technological support/advice** from No Isolation, thereby increasing staff confidence and acceptance of the device.

> "The company are fantastic… I think we've got everything we need and anything I need, you know, I check in with them" (Participant G).

Theme Three- Wider socio-economic factors leading to variability in equality of access to AV1s

Most participants discussed the impact of the **device cost**. For some, the device proved significantly cheaper compared to other alternative provision in the long term. For others, the decision to use the device was affected by school financial constraints. Several comments highlighted how school budgets were limited and the initial upfront cost was expensive for the AV1, which was a key factor that schools considered when deciding to purchase the product. Positively, many participants referred to the use of charities and LA funding as a means of purchasing or renting the device to overcome this barrier. However, this **funding dependency** also impacted on answers around continuation of the device, because whilst participant experiences were largely positive, for some, the use of the device was dependent on whether the charity/LA funding would continue.

> "We were lucky to get them …. they're a great piece of equipment and they're really worth it, definitely. But I suppose for a school to have, if you're having to pay for it yourself, it might be a bit expensive but that's the only thing with them" (Participant A).

> "But at the end of the day it [continuation of the device in school] will come down to the company, the charity or whoever it is that donated it to us or loaned it to us because we haven't bought it" (Participant C).

Most participants explicitly referred to **Wi-Fi dependency** as an important consideration of the device. Whilst the device itself does have 4G in recent models, participants discussed that the design of their buildings often prevented 4G, thereby requiring a secure and stable Wi-Fi. One participant gave the example of their school Wi-Fi not being high-quality due to their location within the country, thereby impacting on the device use.

> "Although we do have Wi-Fi, it operates off kind of 4G as well and mobile signal is not great where we are. So it was occasionally tricky to get it [Wi-Fi]" (Participant D).

Participants also highlighted that:

> "Some parents were a little bit frustrated with the techie side or with the school side, so the parent of the robot was banging her head against the walls. If the family's internet is poor, you're not going to get it [the AV1] to work" (Participant H).

However, most participants reported IT issues were resolved with school IT technician assistance and support from No Isolation.

> "So yeah, there were a few technical difficulties to start with but once it was up and running, no problems at all" (Participant F).

Discussion

This UK study, the first of its kind, has collated and reported the views of ten different staff members relating to their experiences of the AV1. Aligning with international research (Weibel et al., 2020), these findings show promise that the device can support pupils to access their school environment and feel part of the school community. Key strengths of the device relate to (1) supporting academic achievement/engagement and (2) supporting the emotional well-being of pupils by facilitating social contact, again, a growing finding in international literature (Fletcher et al., 2023). Unlike the original purpose of the AV1, findings highlighted that in the UK, the device appears to largely be used for emotional-based reasons, aligning with existing LA reports (SCC & No Isolation, n.d). This suggests that an increasing number of UK settings are adapting the purpose of the AV1, with promising results, to support a wider range of pupil needs.

In consideration of the research question, these findings highlight the generally positive perception of the AV1 device, and its role in improvement of school attendance and emotional well-being. Key areas for consideration relate to specific examples of the device not being successful (for older pupils who did not like the attention) or wider IT-related difficulties. Specific examples of pupils not accepting the device, aligns with existing AV1 research that reports of mixed experiences/successes (Johannessen & Haldar, 2020). Similarly, the discussion around IT-related difficulties is a consistent finding of settings which use TR (Fletcher et al., 2023).

Implications for research and professional practice

From the reported findings, it became apparent that there were key factors which require consideration for effective AV1 device implementation. Discussions around the cost of devices and Wi-Fi-related problems, for example, highlighted a current inequality in relation to access to TR as a form of alternative provision. These findings are widespread in research, with researchers proposing the need for systemic-level considerations, such as improving IT infrastructure across boroughs to enable all schools to have fair access to devices like the AV1 (Johannessen et al., 2022) and UK authorities having a duty to address digital inequality

for all children (González-Betancor et al., 2021). Participant references to wider, systemic factors, such as the socio-economic considerations above, highlight that similar to other interventions, the AV1 device and its use, is intrinsically linked with ecological factors that can influence implementation success (Durlak & DuPre, 2008). Moreover, given the current UK context of schools already using AV1 devices, despite a dearth of UK research, future studies must therefore focus on implementation and consider how AV1s can be best used within education settings.

Given the current dearth of UK-based research around AV1s, participant findings highlighted that implementation considerations must be made if we are to effectively explore the potential of devices, like the AV1, as a form of provision. To support this consideration, the researcher mapped participant findings onto an ecological framework (Durlak & DuPre, 2008) to gain a better understanding of possible associations with implementation science and the impact of ecological factors (Figure 7).

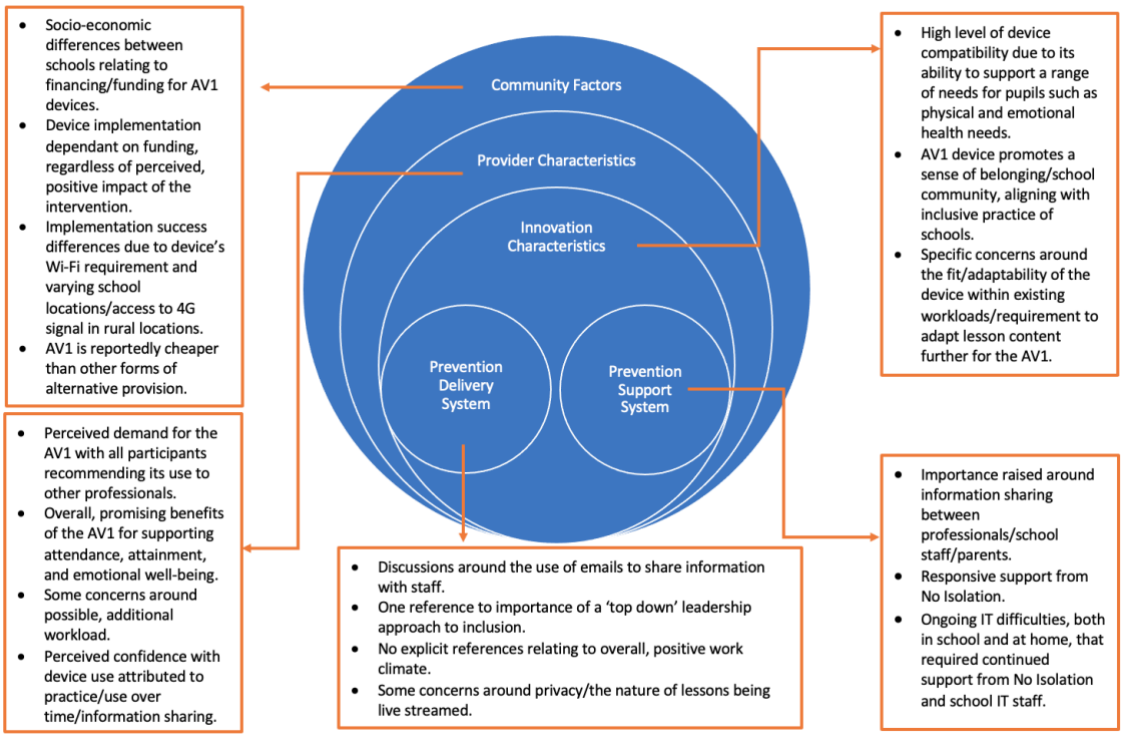

Figure 7. Comparison of findings with the Framework for Effective Implementation (FEI) (Durlak & DuPre, 2008).

Completion of the mapping exercise outlined in Figure 7 found that there were considerable associations between participant experiences and the impact of wider, ecological factors. Whilst the ecological framework used, like any framework, may not fully capture all considering factors around implementation (Durlak & DuPre, 2008), the exercise highlighted that considerations must be made around influencing factors and how the AV1 is effectively implemented.

Kislov et al. (2019) advocates for 'theoretically informative implementation research' (p.6), which enables practitioners to remain evidence informed whilst also promoting the concept that evidence bases are not finalised and should be continually tested and adapted. This flexibility around implementation better aligns with the findings of this study, given that some comments from participants, such as staff/pupil reluctance to use the device, could be explained by other factors that require consideration during implementation. One such factor could be social validity. As previously discussed, social validity research has identified that school staff are unlikely to adopt an intervention if they do not feel it will improve pupil outcomes (such as attainment) or if it is not easy to implement (Daniel & Lemons, 2018). Whilst our findings show promising social validity due to the perceived impact on pupil outcomes, further implementation of the AV1 should also consider social validity more explicitly, through staff, and also parent/pupil perspectives. Social validity research also highlights that in order to support staff acceptance, models of research should be developed that incorporate teacher views into implementation processes (Daniel & Lemons, 2018).

Whilst the application of ecological frameworks for implementation, such as Figure 7, could be considered for the AV1, the findings of this study highlighted the complex, multi-faceted experiences of participants. If adopting a more, flexible, theoretically informative approach (Kislov et al., 2019), it could be argued that a new implementation framework is required for the AV1, one that encapsulates both the impact of ecological factors (Durlak & DuPre, 2008) in addition to other concepts such as social validity and teacher experiences (Daniel & Lemons, 2018). Consequently, we have developed an implementation framework for the AV1 to guide practitioners, informed by implementation science and the experiences of participants in this study (Figure 8).

Figure 8. Proposed AV1 Implementation Framework.

This framework aims to capture both the experiences of participants as well as key areas of implementation science, such as ecological factors (Durlak & DuPre, 2008) and social validity (Daniel & Lemons, 2018). It provides practitioners with areas to consider when utilising AV1s, helping to assist with both effective implementation and the maximisation of staff acceptance (Daniel & Lemons, 2018). Informed from participant experiences and their links to ecological considerations, the inner segments identify six areas that will likely impact on successful AV1 implementation. The introduction of this paper highlighted that currently, implementation literature focuses on universal interventions (Tier 1) as opposed to Tier 3 interventions (Evans & Bond, 2021), likely due to the individualised nature of a Tier 3 intervention. However, social validity research argues that school staff require guidance when using new interventions/approaches, thereby increasing their confidence during implementation (Daniel & Lemons, 2018). Therefore, elaborative questions in Appendix 13 have been provided, informed by participant experiences and consultations with experts in

the field, to guide practitioners during AV1 implementation. These questions aim to empower and inform professionals, whilst also remaining flexible/open-ended to accommodate for the individualised use of the AV1s.

The framework was designed to be non-linear, further promoting a flexible, theoretical informative approach to implementation (Kislov et al., 2019) which better aligns with the findings of this study. A non-linear approach additionally accommodates research debates around fidelity and adaptation, which can promote positive outcomes during implementation (Durlak & DuPre, 2008). The inner segments provide fidelity, by providing participant and ecologically informed factors which must be addressed when implementing an AV1. The outer ring and open-ended questions (Appendix 13) promote practitioner adaptation for their individual contexts. The AV1 itself does lend well to this balance of fidelity vs adaptation, given that the device provides some structure for practitioners via online, information guides (https://www.noisolation.com), however the specifics of implementation (including who it is used with, length of use etc) is left to the professional judgement of the implementer/school setting.

As well as providing flexibility for practitioners, the outer ring attempts to incorporate this framework within existing school review processes, both within the UK and internationally. Whilst evaluation should form part of any intervention (Lendrum & Humphrey, 2012), incorporating this into existing school review processes should support professionals in continually reflecting around implementation success. For example, in the UK, this review process refers to cycles of Assess, Plan, Do, Review (APDR), as outlined in the Special Educational Needs and Disability Code of Practice (Department for Education and Department of Health, 2015), which professionals could incorporate the evaluation of AV1 implementation into these cycles. The decision to incorporate 'supervision and safeguarding' into the outer ring is to emphasise the need for reflection and monitoring of the welfare/safeguarding needs of the child, ensuring there is no detrimental impact to their emotional well-being (United Nations Committee on the rights of the child, 2011). Supervision refers to any form of monitoring/supportive discussions that promotes continual scrutiny of the AV1 during implementation such as between LA professionals and school staff. Whilst external support and supervision is an identified ecological

consideration for implementation (Durlak & DuPre, 2008), the explicit links to APDR processes and safeguarding were devised by the researcher to ensure this framework had social validity for a UK context (Daniel & Lemons, 2018).

Additionally, specific considerations must be made around implementation and the use of AV1 devices for pupils experiencing anxiety/EBSA, given that this was the leading use of the device for participants in this study. Practitioners must consider how the AV1 device can be integrated into EBSA research, which argues the need for ecologically focused, multi-tiered models of intervention (Nuttall & Woods, 2013). Our proposed framework lends itself well to trialling AV1 devices for EBSA cases (see Appendix 14 for an example of how the AV1 can be used within EBSA casework), given that common ecological factors form part of the framework design. Moreover, the highly individualised nature of a Tier 3 intervention (Majeika et al., 2020), like the AV1, would be congruent with best practice support for EBSA cases, given the necessity for EBSA support to also be highly individualised (Corcoran et al., 2022). To support this, settings must consider the use of professionals, such as EPs, when trialling AV1 devices, given that ongoing consultations with mental health professionals/psychologists is promoted when implementing any form of Tier 3 intervention (Berger, 2019).

The purpose of this paper was to provide contributory evidence to the development of an evidence-base for the AV1 from a UK context. Given the explicit links between participant findings and ecological factors (Figure 7), coupled with the important relationship between evidence-based practice and implementation (Damschroder, 2020), it is clear that professionals must consider implementation theory when utilising AV1 devices. Our framework has been designed in consideration of this, whilst also ensuring that staff views are directly incorporated into its design (Daniel & Lemons, 2018). We hope that this framework supports practitioners implementing AV1s both in the UK, as well as internationally given that many of the identified implementation factors echoed findings in other international research studies (Børsting et al., 2019; Johannessen et al., 2022; Weibel et al., 2020). Future research could trial the use of this framework during AV1 implementation, exploring whether this framework supports professionals, and accurately reflects and incorporates the direct views and experiences of LA professionals, school staff,

parents and CYP. Capturing views from other user groups would also strengthen the evidence base for the AV1 and its links to implementation science (Durlak & DuPre, 2008). Given that the framework is a combination of both research and theoretically informed principles, it will be important for future research to trial all aspects of the framework to ensure that they warrant being part of its design. Additionally, further refinement could be completed following consultation with experts working within the field.

As part of trialling this framework, future studies could also capture more quantitative outcome measures, such as school attendance/attainment data or psychometric data from tools such as the strengths and difficulties questionnaire (Goodman, 1997). Findings in this study highlighted how many participants were not yet at a stage to gather quantitative data around the AV1 devices, aligning with the methodologies of other research studies in this field (Fletcher et al., 2023). However, whilst the early implementation of interventions may rely on qualitative measures (such as semi-structured interviews) to explore outcomes, quantitative methods must eventually be explored to truly measure the extent/success of implementation (Smith & Hasan, 2020). Adopting a mixed-method design in future research could allow for further gathering of user perspectives, in addition to more formal, quantitative outcome measures to fully explore AV1 implementation.

Limitations

Whilst this is the first UK academic study to explore the use of AV1s and report experiences of school staff, a potential limitation of this study is that it collected views of school staff only. However, in our earlier work (Fletcher et al., 2023) we identified gaps in relation to all stakeholder views and a focus on UK staff enabled explorations into specific challenges from their perspective. The collection of other participant experiences (such as parents/CYP), across a range of education setting types, alongside formal outcome data (such as attendance data) is required before generalised conclusions around the impact of the devices can be made.

Conclusion

This UK based study explored the views of school staff using AV1s within the UK. Whilst concerns such as cost and IT difficulties have been highlighted, the general consensus is positive in relation to this technology. This paper adds to existing international research that is finding the AV1 to be a useful and effective form of alternative provision or intervention for CYP who have a range of physical and emotional health needs. The devices are perceived to have a positive impact on academic progress, engagement, social contact, and emotional well-being. Considerations for future practice include the possible trial of a proposed implementation framework, as well as the need for further studies to consider EBSA specific implementation factors, evidencing outcomes and capturing the experiences of other, key stakeholder groups such as CYP and parents.

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Paper Three: The dissemination of evidence to professional practice

The dissemination of evidence to professional practice

Introduction

The following paper will consider the dissemination of evidence to professional practice, with regards to the research findings outlined in Papers One and Two. The first section of this paper will consider concepts relating to 'Evidence-Based Practice', 'Practice-Based Evidence' and their associated issues. Section two will provide an overview of effective dissemination of research and notions of research impact, before section three explores a summary of research implications for Papers One and Two across three levels. This paper then concludes with an outlined strategy for both disseminating and evaluating the impact of the research from Papers One and Two.

Section A: Evidence-Based Practice and Related Issues

Psychologists as Scientist Practitioners

Following the 1949 Boulder Conference (Hagstrom et al., 2007), the role of the psychologist is routinely positioned as one of a 'scientist practitioner'. What makes this role so important, is that it bridges science and practice together, promoting a sense of rigour and accountability to work undertaken by psychologists (Lane & Corrie, 2006). Lane and Corrie (2006) outlined four key components that underpin this approach: the ability to think effectively, the ability to weave gathered data into a formulation, the ability to act effectively and the ability to critique work systematically. When acting in this capacity as a scientist practitioner, psychologists can provide a unique contribution to support clients by enhancing the quality of service delivery (Fallon et al., 2010). One way that the scientist practitioner approach promotes rigour to the role of psychologists, is through the importance of being informed by high-quality research, such as evidence-based practice (Lane & Corrie, 2006).

Evidence-based Practice and Practice-based Evidence

Evidence-based practice (EBP) can be defined as "…the integration of the best available research with clinical expertise in the context of patient characteristics, culture, and preferences" (APA, 2006, p. 273). In short, EBP refers to the practice of conducting and

reporting research to support the development of evidence bases for practitioners, whilst also promoting the importance of practitioners remaining flexible/adaptable in light of new, contributing information to existing evidence bases (Dunsmuir et al., 2009). This shift towards EBP within psychology was an attempt to become aligned with research fields that had similarly adopted this practice, such as medicine (APA, 2006). For educational psychologists (EPs), discussions around EBP were also in acknowledgement of the variability in service delivery and support that clients received e.g., the assessment of dyslexia, to promote consistency in the EP role and ensure approaches were well-founded in research (Fox, 2003).

The impact of EBP in psychology is evident, with both the psychologist standards of proficiency explicitly referencing the importance of using EBP in the role (Health and Care Professions Council, 2015) and the publication of research which promotes EBP as a way to advance the field of educational psychology (Fox, 2011). One popular model of EBP is the 'hierarchy of evidence' (Scottish Intercollegiate Guidelines Network, 2015, cited in Boyle & Kelly, 2017). In this model, research designs are ranked, based on their internal validity, proposing that the highest quality research designs are therefore high-quality meta analyses, randomised controlled trials (RCTs) or systematic reviews of RCTs.

Whilst models such as the hierarchy of evidence were originally designed to support EBP in medical fields, their promotion of RCTs as the gold standard approach for research infers potential criticism for psychology researchers. By the hierarchy's own standards, qualitative research would be considered a lower quality-form of research (Sedgwick & Stothard, 2021). Whilst EPs can utilise the research designs in this hierarchy, qualitative designs for research are frequently used as well (as evidenced by the researcher's methodology for Paper Two). Moreover, whilst RCTs may be clinically valid for testing intervention efficacy, they do not necessarily represent the real world context and whether an intervention will work in practice (Frederickson, 2002).

This suggests that EBP hierarchies, such as the one discussed, may not be entirely reflective of research conducted by EPs (Fox, 2003) and could in turn, create a barrier for EPs utilising EBP (O'Hare, 2015). Some advocate for the rejection of RCTs being the gold standard (Fox 2011), arguing that EBP can be formed through high-quality qualitative research as well as

quantitative research (Boyle & Kelly, 2017). This flexibility, i.e. what can contribute to high-quality EBP, is essential, given that a rigid approach to research i.e. using quantitative methods only, often fails to capture the complexity and varying experiences found in studies (Davies et al., 2008).

If EBP is not entirely reflective of the real word context/range of research undertaken by professionals, researchers have proposed an alternative, practice-based evidence (PBE). PBE was a term coined by professionals in attempt to support professionals in utilising principles of EBP whilst also allowing for flexibility to enable them to fill gaps not addressed in the current literature, such as applying interventions to novel clients/contexts (Holmqvist et al., 2015). Whilst more typical EBP adopts a 'top down' approach, where practice is informed solely by clinical trials/existing evidence bases (Rubin, 2007), PBE could be viewed as a 'bottom up' approach, which still considers the clinical research available but also allows for professionals to utilise their own experience and expertise, gathering evidence from ongoing practice within the field they work in (Barkham & Mellor-Clark, 2003). PBE could be viewed as more representative of the psychologist role, given that psychologists typically work directly with children and families, as opposed to more clinical situations such as RCTs that are used to develop EBP (Fox, 2011).

There has been an ongoing disconnect between the EP role and EBP in research (O'Hare, 2015), which may be attributed to debates around what is considered 'gold standard' in research designs. From one perspective, the use of PBE could better align with the role of EPs, given that they are best positioned to trial new techniques, contributing directly to evidence bases through their practice, which is more reflective of PBE principles (Sedgwick & Stothard, 2021). Considering this, it could be argued that EPs should adopt the PBE approach given that it addresses existing issues around knowledge transfer in EBP. Sedgwick and Stothard (2021) highlighted that many EPs often do not base their practice on well-informed techniques/approaches due to many EPs being unable to access peer-reviewed research behind paywalls. PBE would allow EPs to reflect/adapt their work based off the immediate findings in the field, remaining informed around research and contributing this information directly to evidence bases (Barkham & Mellor-Clark, 2003). This could allow for a more effective transfer of knowledge between professionals, as well as ensuring the

evidence base is informed by direct views from practitioners or stakeholders within the field (Sedgwick & Stothard, 2021).

However, solely adopting principles of PBE risks EPs developing biases around their work, with some professionals choosing to ignore research/evidence bases in preference for their own experiences and views (Fox, 2003; Fox, 2011). The additional concern is that PBE does not solely address all issues relating to knowledge transfer. Research highlights that regardless of whether information has been gathered through EBP or PBE, it is how this information is disseminated that impacts on the effective transfer of knowledge amongst professionals (Sedgwick & Stothard, 2021). To address this issue of knowledge transfer, research highlights the importance of professionals utilising implementation science (Kelly, 2017).

Implementation science is an area which considers this EBP vs PBE dilemma, providing guidance around implementing EBP interventions whilst still accommodating for the flexibility/change that is required for real-life applications (Kelly, 2017). This is often achieved using implementation frameworks that promote the successful and consistent implementation of interventions (Sedgwick & Stothard, 2021), whilst allowing for flexibility and adaptiveness to the implementer's needs (Kelly, 2017). If the EP role is one of a scientist-practitioner, and this role promotes the importance of EBP for scientific rigour and consistency (Shaw, 2021), considerations must be made around how EPs can both adopt EBP principles whilst also incorporating aspects of PBE to ensure successful real-world applications of interventions.

Barkham and Mellor-Clark (2003) proposed that EBP and PBE principles can be harmonious and complementary to each other. Consequently, one could argue that the development of a bridge between EBP and PBE could be achieved using implementation science. Not only could this address the EBP vs PBE debate for EPs, but implementation science could also help to address the issue of knowledge transfer, ensuring that research is effectively disseminated (Sedgwick & Stothard, 2021). Considerations of implementation science are discussed further in this paper, in relation to the researcher's empirical study in Paper Two.

Section B: Effective Dissemination of Research and Notions of Research Impact

As discussed above, whilst the debate around EBP vs PBE continues in the EP field, research has highlighted that focus should be placed on research dissemination. Research dissemination can be defined as "…a planned process that involves consideration of target audiences and the settings in which research findings are to be received… communicating and interacting with wider policy and health service audiences in ways that will facilitate research uptake in decision-making processes and practice" (Wilson et al., 2010, p.2). Considered to be the catalyst for improving practice and professional decision-making (Sedgwick & Stothard, 2021), the importance of dissemination is well-founded, and the responsibility of dissemination lies with the researcher themselves and those who have funded the research (Wilson et al., 2010).

There are multiple ways of disseminating research, including the use of publications, workshops, and conferences (Harmsworth et al., 2001). Recently, there have been increased considerations of alternative means of dissemination, such as the use of social media (Chan et al., 2020). The covid-19 pandemic provided an interesting opportunity to explore dissemination practices, given that medical publications decreased the length of time between submission and publication by 49%, thereby increasing the speed in which new medical information was being published into the field (Horbach, 2020). Whilst on one level, this could be viewed as an attempt to quickly disseminate research during a crisis, future publications have since critiqued this approach, raising concerns around the lack of rigour/lower-quality methodology of papers that had been published (Khatter et al., 2021). Whilst these debates relate to the medicine field, it raises an important question around dissemination. Journal publication has long been considered the 'gold standard' approach for dissemination, likely attributed to the accountable, peer-review process (Kumar, 2009). However, if this is at the expense of research quality, perhaps alternative means of dissemination should be considered alongside publication.

This remains particularly true for EPs, given that disseminating research via journals/online publications only, may not be effective in reaching target audiences. A recent systematic review of research dissemination methods for teachers, found that sharing evidence-based information to teachers via email was not effective in motivating teachers to apply the

evidence into practice (Erkan, 2021). Similarly, research dissemination has been critiqued for focusing on disseminating research findings only to other researchers, often neglecting non-researchers (Knoepke et al., 2019). What this highlights is that typically, some stakeholder groups are often excluded from dissemination, or if they are considered, the chosen means of dissemination does not result in a change of practice. When devising a plan for dissemination, EPs must therefore consider how to disseminate research, as well as considering the objective of dissemination, to help ensure there is a positive impact/change from disseminating the research (Sedgwick & Stothard, 2021). One way this could be achieved is by using dissemination frameworks.

Dissemination frameworks are theoretically informed, and support researchers in adopting a systematic and thorough process when developing a research dissemination plan (Wilson et al., 2010). Harmsworth et al. (2001) proposed one such framework, which considered dissemination at three distinct levels: dissemination for awareness, understanding and action. This particular framework has previously been associated with EP research (Sedgwick & Stothard, 2021), which is likely due to this framework providing prompts/considerations around measuring impact as part of its dissemination strategy. The additional benefit of this chosen framework is that it considers dissemination at multiple levels, acknowledging that the means/intensity of dissemination may vary according to the target audience that researchers are aiming to reach (Sedgwick & Stothard, 2021).

An additional factor to consider when disseminating research is the role of implementation science. Implementation strategies must be considered alongside dissemination strategies to create an effective, strategic plan for EPs when disseminating research (Sedgwick & Stothard, 2021). This is due to research highlighting that higher levels of implementation are associated with increased, positive intervention outcomes (Durlak & DuPre, 2008). Consequently, the use of implementation science would help to further promote considerations around research impact, and how this will be measured/tracked as part of a dissemination plan. Currently, dissemination frameworks and implementation frameworks often overlap in their design, which has been previously attributed to a lack of clarity around ‘best practice’ for research dissemination (Baumann et al., 2022). Given the importance, highlighted above, of both dissemination and implementation, the researcher has

incorporated both areas into their research. The use of a dissemination framework will therefore be discussed to inform the researcher's dissemination plan, alongside considerations of how this links into the implementation science and framework that has been designed as part of the researcher's empirical study in Paper Two.

Section C: Summary of the Policy/Practice/Research Development Implications

Paper One reports on a systematic literature review (SLR) which explored user perspectives of robotic telepresence technology (RTT) in schools. A thematic synthesis of existing, published research generated three global themes: potential for RTT to facilitate engagement, technical design factors influencing utility and acceptability of RTT to users. Key findings are reported through a narrative description of each theme, alongside a thematic map. Overall, research implications related to a dearth of UK-based research in this field and a lack of high-quality empirical studies, as evidenced by the scores of the researcher's weight of analysis review process.

Paper Two reports on the researcher's empirical study, which explored the perspectives of school staff regarding a popular RTT device in use, the AV1. Semi-structured interviews were completed with ten staff across different settings within the UK. Key findings related to the promising benefits of the AV1 device for supporting key child outcomes such as attendance, attainment, and emotional well-being; as well as areas for development such as financial considerations and IT-related difficulties. Paper Two also acknowledges the exponential uptake of AV1 devices within UK LAs, highlighting that evidence is now only beginning to catch up with practice via the emerging publication of LA reports. Paper Two then concludes with the proposal of an implementation framework for devices such as the AV1, which was developed in consideration of both implementation science and the views captured from participants. This framework was also designed in consideration of the fact that UK research about AV1 devices is only beginning to catch up with practice, attempting to bridge the EBP vs PBE dilemma and ensure that professionals are adhering to evidence bases. Future research implications are discussed which related to the need for capturing views of other users, such as children and young people (CYP), the requirement for capturing formal outcome data e.g., attendance data, as well as the proposal of future researchers trialling the use of the implementation framework.

Papers One and Two both have important implications for research/professional practice given that they are the first, UK-based academic papers which explore the use of RTT. Paper One has implications due to both identifying the current gap in research from a UK perspective, alongside collating key areas of consideration which can support future RTT research e.g., the lack of specific focus on user perspectives. Paper Two then builds on the implications of Paper One, by conducting an empirical study, with a specific focus on one type of popular RTT in use, as well as one population of user perspectives (school staff). Key findings are transferrable from both papers given that they both provide guidance for professionals already using such devices, including through the proposed implementation framework, as well as promoting the importance of new research to develop an evidence base for the UK. Considering this, the research findings of Papers One and Two have implications at three different levels: the research site, organisational level and professional level.

The research site

The research was commissioned by a combined authority within the North West of England. The original intention was to explore delivery and implementation of AV1 robots within Greater Manchester. However, due to the impact of covid-19, rollout of the devices was slow, therefore the focus of the project widened, to explore how the devices were being used nationally. The commissioner hoped for the research to inform their planned implementation of the AV1 device across schools, highlighting that there is a growing demand for research around RTT within the UK. Paper One provided a theoretical foundation for the commissioning, synthesising key findings from existing RTT research. This paper highlighted that whilst there are promising applications of devices, there is a limited scope of research, particularly from a UK perspective, with no UK-based studies identified in the SLR. This informs Paper Two, which provided the first UK, empirical-based study around a robotic telepresence device. This paper identified that there is positive promise of the devices supporting child outcomes, if considerations are made around key factors such as financing and IT difficulties. Both papers highlighted the seminal role that educational psychologists (EPs) can play, which in turn would support the commissioning of further research. Future projects could build upon this research, such as capturing other user perspectives and reviewing formal outcome data. Given the broad scope of this research

site, the findings of Papers One and Two will be informative for implementing RTT across the UK and developing an evidence base.

Paper One also highlighted that RTT has evolved in its use, with increasing applications for pupils experiencing emotionally based school avoidance (EBSA). This was similarly confirmed by Paper Two's findings, which found that in ten UK school settings, the leading use of the device was to support pupils with anxiety-related attendance difficulties. Given the current focus of EBSA within education, as evidenced by recent government guidance (Department for Education, 2023), future research around RTT with a specific focus on EBSA would likely be appealing to future researchers. This could be a future commissioning project for trainee EPs.

Organisational level

Paper One highlighted key considerations for organisations such as local authorities, schools, and developers of RTT. Findings discussed the importance of promoting inclusive practice, with RTT showing potential as a tool to support this. This paper concludes with recommendations for organisations to continue exploring all means of promoting inclusive practice, including through the use of RTT devices. Paper One additionally emphasises the importance of multi-agency working, highlighting that EPs are best placed to explore the potentiality of devices due to their role working across individual, group and systemic levels. The findings in Paper Two further confirm this viewpoint, by identifying that the AV1 device has been positively used to promote inclusion for all pupils. With staff identifying that the device enabled CYP to remain part of the school community, Paper Two further disseminates information to organisations around the need to consider the use of such devices.

Papers One and Two both highlighted that whilst promising, not all findings were positive relating to devices like the AV1. There remain ongoing considerations such as IT difficulties and a sense of concern around the device's privacy and compliance with General Data Protection Regulations (GDPR). The introduction of an implementation framework in Paper Two, was designed to support organisations in reflecting around these considerations. This framework will be of use to schools given that it provides a rigorous and systematic

approach to device implementation, informed by research and practice-based evidence from participants. The references to funding in this framework, may also lead to wider organisations (such as local authorities) considering how these devices will be financed, placing less pressure on individual schools to fund the devices. From a development perspective, the framework may also inform developers around RTT and devices like the AV1, promoting thinking around how devices can be modified to address the reported difficulties, such as IT issues.

Professional level

Paper One disseminates findings that can inform professionals on a national level due to this being the first SLR of its kind. The findings of Paper One collates the experiences of users from an international context. This information can then support professionals across the country who are already implementing RTT devices around key areas to consider, such as IT difficulties and the importance of information sharing amongst professionals. EPs could have a pivotal role around this, such as supporting with the measurement of outcomes across a local authority. Moreover, Paper One highlights that currently, published research is limited in terms of quality, which promotes considerations around the need to ensure that any commissioned research is of a higher quality. For example, this could include the consistent use of more standardised measures to track progress at multiple time points. Given the previously discussed role of an EP being a scientist-practitioner, EPs would be best placed to support with this development of a higher-quality UK evidence base.

Paper Two disseminates important information around the AV1 device, which is already in use across the UK. The creation of the implementation framework will help to ensure that professionals are remaining informed of evidence-based research related to the devices, as well as providing support around how to effectively implement them. The combined findings of Papers One and Two will also support professionals nationally, who are considering the use of RTT and wish to review the existing evidence base and considerations around their use. This will ensure that professionals are fully informed about the research field, assisting any decision making processes around whether RTT devices are appropriate to use for their specific context.

Section D: A Strategy for Promoting and Evaluating the Dissemination and Impact of this Research

Harmsworth et al. (2001) outlined three distinct levels of dissemination: dissemination for awareness, understanding and action. Each level considers the need for dissemination to a range of target audiences, whether this is to audiences who may not know much about the field but may benefit from information sharing (dissemination for awareness), for audiences who are directly linked to the research and will benefit from a more in-depth understanding (dissemination for understanding) or audiences who are best placed to bring about systemic change by adopting key findings/information from the research project (dissemination for action). Table 3 outlines an overview of the researcher's specific strategy for promoting and evaluating the dissemination and impact of research Papers One and Two, in consideration of these three levels of dissemination.

Target Audience	Aspect of Research to Disseminate	Dissemination Level	Method of Dissemination	Aspired Outcome	Evaluation Method
EPs & Trainee EPs (TEPs)	Definition of RTT from Paper One and overview of a popular device, the AV1, from Paper Two. Findings from a pilot project which interviewed two professionals within the UK will also be disseminated.	Awareness Understanding	Ongoing EBSA working group within the University of Manchester. This group shares research findings to inform other professionals/increase awareness of the type of provision available for pupils, including RTT. Publication of the researcher's previous pilot project (Assignment 1) in the DECP Debate journal (published October 2022) which explored the use of AV1 in the UK. The link to this publication was also disseminated via Twitter (Appendix 15).	To increase awareness of RTT and the AV1 given the increasing likelihood of EPs and TEPs coming across these devices during their work.	Ongoing feedback from the working group such as answering queries around RTT and its applications within local authorities. **(Completed)** Interactions with the DECP Debate article and views from the Twitter post. Currently, the tweet has been viewed 4190 times and re-tweeted by 11 different professionals. Five other professionals have also directly commented on

					the twitter post. **(Completed)**
TEPs	Findings of Paper One and Paper Two relating to user perspectives of RTT and its impact on child outcomes alongside key facilitators and barriers to implementation.	Awareness Understanding	Presentation at a cross-cohort day with Year 1, 2 and 3 TEPs (May 2022) (Appendix 16). Delivering a lecture to Year 2 TEP cohort following an invitation from Manchester lecturers (February 2023) (Appendix 17).	To increase understanding around RTT implementation and considerations around facilitators and barriers.	Positive, verbal feedback received by colleagues, including two TEPs who emailed the researcher privately with praise for the presentations. There is also an ongoing, open offer of communication with TEPs should they come across the devices and require further support and research information. **(Completed)**
School Staff & Pupils	Paper One considerations around facilitators and barriers to RTT implementation. Paper Two findings around the use of AV1s to support pupils experiencing EBSA/physical health needs.	Awareness	Presentation at a local secondary school to explain the role of an EP and current research being undertaken (Appendix 18).	School professionals will become aware of RTT and its potential applications within school settings.	Open offer of continued contact with the TEP to discuss the research. Currently, the local secondary school have discussed this research with another school, who have contacted the EP team (December 2022) to request a meeting to discuss the

					AV1 robots further. **(Completed)**
Local Authority (LA) staff	Findings of Paper Two relating to the promising impact of AV1 on child outcomes. The implementation framework designed in Paper Two will also be shared to inform effective implementation of devices.	Awareness Understanding Action	Creation of a project proposal (Appendix 19) to develop an EBSA pathway within the researcher's LA. This pathway will develop a LA approach to supporting attendance, including through the use of AV1 devices.	To support the LA in promoting inclusive practice and alleviating attendance difficulties including through the use of AV1s as a form of provision.	Improved attendance of pupils experiencing EBSA and increased LA confidence in how to support such pupils. **(Completed- project approved in March 2023)**
EPs & TEPs	An overview of current research relating to RTT as reported in Paper One. Key Paper Two findings relating to the AV1 implementation within the UK, alongside the introduction of the proposed implementation framework designed by the researcher.	Understanding Action	Publication of Paper One in 'Educational Psychology in Practice, EPiP' (published January 2023). The link to this publication was also disseminated via Twitter (Appendix 20).	To disseminate the first research papers, from a UK context, around RTT and the AV1 device, improving understanding around the devices and their potential impact and how to effectively	Interactions with the EPiP journal and views from the Twitter post. Currently, the paper has been downloaded 219 times. The tweet has been viewed 3801 times and re-tweeted by 11 different professionals. Nine other professionals have also directly commented on the

			Submission of Paper Two to 'EPiP' (submitted April 2023). Application to present at the International School of Psychology Association (ISPA) Conference in July 2023 as part of an EBSA symposium with other Manchester researchers.	implement them within education settings.	twitter post. **(Completed)** Awaiting outcome of peer review for Paper Two. Aspired evaluation methods are the same as above for Paper One. Confirmed acceptance of ISPA application. It is hoped that this will be evaluated through delegate engagement/interest in the research.
School Staff & LA Staff	An overview of current research relating to RTT as reported in Paper One. Key findings relating to the AV1 implementation within the UK, alongside the introduction of the proposed model of implementation	Understanding Action	Dissemination of Papers One and Two to participants via email-this was agreed at the time of gathering research data Dissemination of Papers One and Two to the North West RTT group which meet to discuss RTT and its	To disseminate the first research papers, from a UK context, around RTT and the AV1 device, improving understanding around the	Papers One and Two will be disseminated to participants and the working group, providing an understanding of the research. It is hoped that feedback will be positive, relating to improving staff confidence around implementation. This information can then be shared by others to their

	designed by the researcher.		implementation across 4-5 LAs. Creation of video blogs, outlining the research in an accessible format via animations (Appendix 21). Video blogs have been approved by the AV1 creators, who will upload the blogs to their website to disseminate findings of Papers One and Two internationally.	devices, their potential impact and how to effectively implement them within education settings.	own contacts, maximising the breadth of dissemination to schools. Evaluation feedback will be gathered via the number of website views /interactions. It is difficult to gather direct responses however it is hoped that the blogs will increase awareness of research, informing understanding/actions for settings who use the AV1.

Table 3. Dissemination Strategy.

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Appendices

Appendix 1: Educational Psychology in Practice author guidelines

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Updated 14th June 2022

Appendix 2: Full-text review of papers with reasons for/against inclusion in the SLR

Does it meet Inclusion/Exclusion Criteria? (Y/N)				A	B	C	D	E	F	G	H	I	J	Include? Green/Red	Additional Comments
	Name	Title	Year												
1	Ahumada-Newhart and Olsen	Going to school on a robot: Robot and user interface design features that matter	2019	Y	Y	Y	Y	Y	N	N	N	N	N		
2	Ahumada-Newhart and Eccles	A Theoretical and Qualitative Approach to Evaluating Children's Robot-Mediated Levels of Presence	2020	Y	Y	Y	Y	Y	N	N	N	N	N		
3	Beeman and Henderson	Video-conferencing technology brings a homebound middle grades student to the classroom: Educators and parents collaborate to connect a homebound student with his classmates using two-way video technology	2012	Y	N	Y	Y	Y	N	N	N	N	N		
4	Bloss	High school student goes to class robotically	2011	Y	N	N	Y	N	N	Y	Y	N	N		
5	Børsting and Culén	A Robot-Avatar: Easier Access to Education and Reduction in Isolation?	2016	Y	N	Y	Y	Y	N	N	N	N	N		N/A- conference paper
6	Botev and Lera	Immersive Robotic Telepresence for Remote Educational Scenarios	2021	Y	N	N	Y	N	N	Y	N	N	N		
7	Breivik	A study on the inclusion of students with ME and school refusal	2017	Y	Y	Y	Y	Y	N	N	N	N	N		
8	Cha et al	Designing Telepresence Robots for K-12 Education	2017	Y	Y	Y	Y	N	N	Y	Y	Y	N		
9	Chubb et al	'Being there': technology to reduce isolation for young people with significant illness	2021	Y	Y	Y	Y	Y	N	N	N	N	N		
10	Culén et al	Mediating Relatedness for Adolescents with ME: Reducing Isolation through Minimal Interactions with a Robot Avatar	2019	Y	N	Y	Y	Y	N	N	N	N	N		N/A- conference paper
11	Fitter et al	Evaluating the Effects of Personalized Appearance on Telepresence Robots for Education	2018	N	Y	Y	Y	Y	Y	N	N	N	N		
12	Child & Hospital Foundation	Report Impact: AV1 Robot	2019	Y	Y	Y	Y	Y	N	N	N	N	N		

13	Gallon et al	Using a Telepresence Robot in an Educational Context	2019	Y	Y	Y	Y	N	N	N	N	N	N		
14	Han and Conti	The Use of UTAUT and Post Acceptance Models to Investigate the Attitude towards a Telepresence Robot in an Educational Setting	2020	N	Y	N	N	Y	Y	N	N	N	Y		
15	Henriks	Final report: Communication robot AV1	2017	Y	Y	Y	Y	Y	N	N	N	N	N		
16	Hopkins et al	Utilising technology to connect the hospital and the classroom: Maintaining connections using tablet computers and a 'Presence' App	2014	N	Y	Y	Y	Y	N	N	N	N	N		
17	Johannessen and Haldar	Can a robot help long-term sick children? Experiences with AV1 in school	2020	Y	Y	Y	Y	Y	N	N	N	N	N		
18	Lister	Meaningful Engagement via Robotic Telepresence: An Exploratory Case Study	2020	Y	Y	Y	Y	Y	N	N	N	N	N		
19	Newhart et al	Virtual Inclusion via Telepresence Robots in the Classroom: An Exploratory Case Study	2016	Y	Y	Y	Y	Y	N	N	N	N	N		
20	Newhart	Virtual inclusion via telepresence robots in the classroom. (Extended Abstract)	2014	N	N	N	N	N	N	N	N	N	N		
21	Newhart	Are They Present: Homebound Children with Chronic Illness in Our Schools and the Use of Telepresence Robots to Reach Them	2018	N	N	N	N	N	N	N	N	N	N		
22	Newhart and Olsen	My student is a Robot: How Schools Manage Telepresence Experiences for Students	2017	Y	Y	Y	Y	Y	N	N	N	N	N		N/A- conference paper
23	Reuben et al	Long-Term, in-the-Wild Study of Feedback about Speech Intelligibility for K-12 Students Attending Class via a Telepresence Robot	2021	N	Y	Y	Y	N	N	N	N	N	N		
24	Shin and Han	Children's Perceptions of and Interactions with a Telepresence Robot	2016	N	N	N	N	N	Y	N	N	N	N		
25	Skubo	Evaluation of the "robot project 2020"	2020	Y	Y	Y	Y	Y	N	N	N	N	N		
26	Soares and Craven	Mobile Robotic Telepresence Solutions for the Education of Hospitalized Children	2017	Y	Y	Y	Y	N	N	Y	N	N	N		

27	Søraa et al	Children's perceptions of social robots: a study of the robots Pepper, AV1 and Tessa at Norwegian research fairs	2021	N	Y	Y	Y	Y	N	Y	N	N	N		
28	Thommesen	A qualitative interview study of six young people's thoughts and experiences around facilitation and inclusion	2017	N	Y	N	Y	Y	N	N	N	N	N		
29	Tota and Vaida	Dedicated Applications of Telepresence Robots For Education	2019	N	N	N	N	N	N	Y	N	N	N		
30	Weibel et al	Back to school with telepresence robot technology	2020	Y	Y	Y	Y	Y	N	N	N	N	N		
31	Wheatley	Supporting students with medical needs in school	2019	N	N	N	N	N	N	N	N	N	N		
32	Zoder-Martell et al	Teachers' Willingness to use a Telepresence Robot for Consultation with Students with Autism Spectrum Disorder	2021	N	Y	Y	Y	Y	Y	N	N	N	N		

Inclusion and Exclusion Criteria

A	Using robotic telepresence technology to access learning due to illness/health/SEMH reasons. (Terminology may say videoconferencing, teleconferencing, video software).
B	Empirical based study (i.e. published paper with a research design) within schools/hospital schools.
C	Telepresence technology used with Primary to Secondary age range pupils (5-18).
D	Published in the last 10 years (dataset/technology must be within this timeframe as well). From Jan 2011-September 2021.
E	Gathers direct views from stakeholders (teachers, parents, pupils) (e.g., via interview, survey, questionnaire, focus group) and reports these i.e. via direct quotes or narrative description.
F	Robots are only used to deliver learning to all children/support teaching (e.g. using robots to teach EAL children. The technology must not be used to assist/deliver teaching for the whole class as part of typical teaching methods).
G	Lab based or hypothetical research (i.e. discussing how the technology could be used or imagining what it would be like).

H	Meta-Analysis/Systematic reviews of other papers (must also not review the technology in general/provide suggestions on how the technology could be used in a school context).
I	Paper is more than 10 years old.
J	Telepresence technology used for pupils aged 19+ (University age).

Appendix 3: Weight of Evidence (WoE) analysis of included papers

Does it meet Inclusion/Exclusion Criteria? (Y/N)			A	B	C	D	E	F	G	H	I	J	Included?	WoE Rating /20	Inter-rater Agreement /15
	Name	Year													
1	Ahumada-Newhart and Olsen	2019	Y	Y	Y	Y	Y	N	N	N	N	N		12.5	
2	Ahumada-Newhart and Eccles	2020	Y	Y	Y	Y	Y	N	N	N	N	N		12.5	87%
3	Breivik	2017	Y	Y	Y	Y	Y	N	N	N	N	N		9.5	100%
4	Chubb et al	2021	Y	Y	Y	Y	Y	N	N	N	N	N		11.75	
5	Child & Hospital Foundation	2019	Y	Y	Y	Y	Y	N	N	N	N	N		12.5	
6	Henriks	2017	Y	Y	Y	Y	Y	N	N	N	N	N		2.25	
7	Johannessen and Haldar	2020	Y	Y	Y	Y	Y	N	N	N	N	N		9	100%
8	Lister	2020	Y	Y	Y	Y	Y	N	N	N	N	N		10.5	
9	Newhart et al	2016	Y	Y	Y	Y	Y	N	N	N	N	N		12	
10	Skubo	2020	Y	Y	Y	Y	Y	N	N	N	N	N		7	
11	Weibel et al	2020	Y	Y	Y	Y	Y	N	N	N	N	N		15.5	100%

Appendix 4: Weight of Evidence Qualitative Research Framework and worked example

Educational and Psychology Research Group
Critical Appraisal Review Frameworks

Qualitative Research Framework

The University of Manchester Educational Psychology Critical Appraisal Review Frameworks were first developed in 2011 (Woods, Bond, Humphrey, Symes & Green, 2011). Since then the frameworks have been developed and extended as flexible tools for the critical appraisal of a wide range of qualitative and quantitative research that may be drawn upon by practising psychologists. This 2020 version of the qualitative research framework is designed to support critical appraisal of qualitative research, whether broadly an evaluation or investigation study.

The frameworks have been widely used and adapted in many published systematic reviews of evidence. Recent versions of the qualitative research framework have been used, or adapted for use, in evidence reviews by Akbar & Woods, (2019); Tomlinson, Bond and Hebron (2020); Simpson and Atkinson (2019); and Tyrell and Woods (2018). If using, or adapting, the current version of this checklist for your own review, cite as:
Woods, K. (2020) *Critical Appraisal Frameworks: Qualitative Research Framework*. Manchester: The University of Manchester (Education and Psychology Research Group).

References

Akbar, S., & Woods, K. (2019). The experiences of minority ethnic heritage parents having a child with SEND: A systematic literature review. *British Journal of Special Educational Needs.* https://doi.org/10.1111/1467-8578.12272

Simpson, J., & Atkinson, C. (2019). The role of school psychologists in therapeutic interventions: A systematic literature review, *International Journal of School & Educational Psychology*. DOI: 10.1080/21683603.2019.1689876

Tomlinson, Bond & Hebron (2020). The school experiences of autistic girls and adolescents: A systematic review. *European Journal of Special Needs Education, 35*(2), 203-219. https://doi.org/10.1080/08856257.2019.1643154

Tyrell, B., & Woods, K. (2018). Methods used to elicit the views of children and young people with autism: A systematic review of the evidence. *British Journal of Special Education, 45*(3), 302-328. DOI: http://dx.doi.org/10.1111/1467-8578.12235

Woods, K., Bond, C., Humphrey, N., Symes, W., & Green, L. (2011). *Systematic Review of Solution Focused Brief Therapy (SFBT) with children and families.* (DfE Research Report RR179). Retrieved on 20.4.20 from https://www.education.gov.uk/publications/standard/publicationDetail/Page1/DFE-RR179

Author(s): Johannessen and Haldar (2020)

Title: Can a robot help long-term sick children?

Journal Reference: Report Oslo Met

Criterion/ score		R1	R2	Agree %	R1	R2	Agree %	Comment
Clear aim of research *e.g. aim/ goal/ question of the research clearly stated, importance/ utility justified*	**1** **0**	1	0.75		0.75	0.75		3 clear RQs but focus is on school but data reflect home too Home views may technically capture school views if pupils are accessing learning from home.
Appropriateness of the research design *e.g. rationale vis-à-vis aims, links to previous approaches, limitations*	**1** **0**	1	1		1	1		Section 9 – aim of contextualised understanding articulated
Clear sampling rationale *e.g. description, justification; attrition evaluated*	**1** **0**	0.75	0.5		0.75	0.75		Range of participants but quite opportunistic (section 9) Participants only recruited via one foundation.
Appropriateness of data collection method *e.g. methods link to research aims, rationale for method provided*	**1** **0**	0.75	0.5		0.75	0.75		Section 9. Some rationale for methods but not tightly linked to RQs or clear how integrated. Justified use of telephone interviews as well as gathering additional, supporting secondary data. Just missing link to research aims explicitly.
Well executed data collection *e.g. clear details of who, what, where, how; intended/ actual (if modified) effect of execution on data quality; data saturation considered*	**2** **1** **0**	1	1		1	1		Flexible SSI schedule and process over time outlined in section 9. Breakdown of participant numbers but unspecified

								details. No mention of saturation however there is a relatively large sample size.
Analysis close to the data, *e.g. researcher can evaluate fit between categories/ themes and data, participant 'voice' evident*	**2** **1** **0**	1	0.5		0.75	0.75		Analysis and how themes arrived at unclear but did include quotes. Participant voice via quotes and clear sectioned themes. However, no reference to data analysis method specifics.
Evidence of explicit reflexivity *e.g.* • *impact of researcher (vis-à-vis cultural/ theoretical position; researcher-participant relationship)* • *limitations identified* • *data validation (e.g. inter-coder checks/ peer moderation/ consultation)* • *researcher philosophy/ stance evaluated* • *conflict of interest statement included*	**4** **3** **2** **1** **0**	1	1		1	1		Some limitations identified. Limitations, discusses transfer value of research. But discussion of findings not linked back to research or indication of member/inter-rater checking.
Negative case analysis, *e.g. e.g. contrasts/ contradictions/ outliers within data; categories/ themes as dimensional; diversity of perspectives.*	**1** **0**	1	1		1	1		Some evidence of dimensional themes Open regarding contrasting themes/views.
Evidence of researcher-participant negotiation of meanings, *e.g. member checking, methods to empower participants.*	**1** **0**	0	0		0	0		No indication of member checking or detailed reference to data analysis.
Valid conclusions drawn *e.g. data presented support the findings which in turn support the conclusions*	**1** **0**	0.75	0		0.5	0.5		Conclusions quite limited and as analysis not explained difficult to know how reflective of data set as a whole. Section 8- conclusions and recommendations. Links analysis to next step considerations BUT not explicitly

								linked back to research questions.
Emergent theory related to the problem, *e.g. links to previous findings/ explanation of changes or differences/ abstraction from categories/ themes to model/ explanation.*	**1 0**	0	0		0	0		No theory
Transferable conclusions *e.g. contextualised findings; limitations of scope identified.*	**1 0**	1	0.5		0.5	0.5		Briefly mentioned Section 8.
Evidence of attention to ethical issues *e.g. presentation, sensitivity, minimising harm, feedback*	**1 0**	0.5	0.5		0.5	0.5		Mentioned safeguarding and confidentiality Ethics mentioned at the end.
Comprehensiveness of documentation *e.g. schedules, transcripts, thematic maps, paper trail for external audit*	**1 0**	0.25	0		0.25	0.25		Reference to general interview areas in text.
Clarity and coherence of the reporting *e.g. clear structure, clear account linked to aims, key points highlighted*	**1 0**	0.5	0		0.25	0.25		Structure unclear Disorganised structure i.e. method at the end of report however there is a clear method, results/discussion and conclusion.
Total	*Max* 20	10.5	7.25	Mean % agree **43.75 %**	9	9	Mean % agree **100%**	**100%**

Kevin Woods, 23.4.20

Appendix 5: Example of Thematic Synthesis Process

Appendix 5a: Stage 1- Inductive line by line coding of the included papers

Example of Process for Theme 3- Technical design factors influencing utility

Extract from: Ahumada-Newhart and Olsen (2019)- Going to School on a Robot: Robot and User Interface Design Features that Matter

4.1.1 Wi-Fi Connectivity. The most cited frustration with the use of telepresence robots in this study was the Wi-Fi connectivity. Other researchers studying office and health care uses of telepresence robots have stressed the importance of connectivity [12, 22, 26, 39, 45, 48]. Because students are mobile for long periods of time, connectivity is a particularly salient need for them. In our study, all 19 cases, their parents, teachers, administrators, and their classmates cited frustration with the connectivity of the robot and the remote student "turning off."

Connectivity issues varied from spotty connectivity throughout the day to prolonged absence due to school connectivity issues. Some were spotty connections where a student would suddenly be disconnected for a brief time. Eileen said, "It loses connection a lot and like gets back on five seconds later and I miss like the middle of a sentence that the teacher would be saying." Others were long-term disconnections. Eileen's mother reported that, "There were times when she couldn't go to class at all because we couldn't get it to connect." Nathan also reported that, "Sometimes it logs off and then it stays gray...takes like 30 minutes to log back on..." Victor had not been able to attend school for three months due to connectivity issues at the school. The principal of his school had provided the funds for Victor to have adequate Wi-Fi at his home but the school's technology team had not been able to work out the connectivity issues at the school in order for the robot to operate within the school. The robot sat unused and Victor reverted to limited home tutoring until the school's technology team was able to provide the necessary hardware and connectivity. More commonly, the connectivity issues were spotty and related to the strength of the school's Wi-Fi. Dan's principal reported that "The big problem [was that]....we tested with no kids in the building and it ran...but once the students came...they got all those cell phones and tablets going and...suddenly there were dead spots that we didn't find...and he would be driving...and it would just quit." Even when additional routers were installed, administrators still failed to understand why the robot would disconnect while traveling through the school. An administrator blamed it on the robot's system, saying, "It needs a stronger receiver system...cuz my phone and my tablet don't lose connectivity where that robot's going dead." Understanding that connectivity might be an issue created opportunities for classmates to help in school areas where there were dead spots. Nick's teacher pointed out that, "My understanding is that he drove himself with an escort, and the only time people needed to carry him was when the Wi-Fi knocked out or the Bluetooth knocked out in a dead zone in our school, which ironically is the hallway that you have to take to come out to where I am in the trailers..."

Commented [mf1]: Common Frustration- Wi-Fi difficulties

Commented [mf2]: Impacted on access to school education- from short periods of time to prolonged time lengths

Commented [mf3]: Wi-Fi difficulty expressed by direct user of the robot

Commented [mf4]: Wi-Fi difficulty expressed by parent of the robot user

Commented [mf5]: Significant impact on access to school education (3 months)

Commented [mf6]: Support from school team-financial

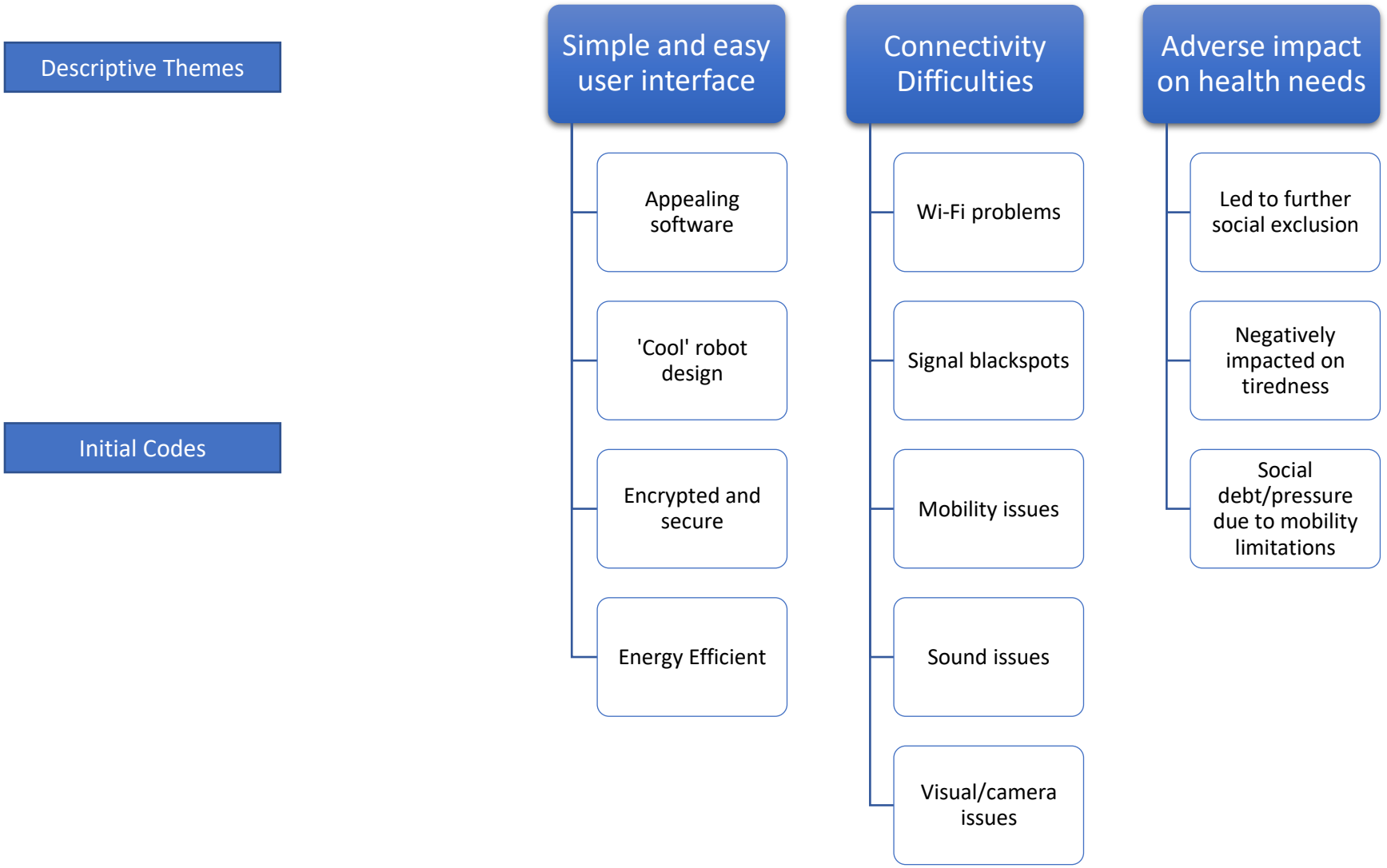
Commented [mf7]: Reverted to home tutoring

Commented [mf8]: Wi-Fi dead spots within the building

Commented [mf9]: Possible design fault of the robot

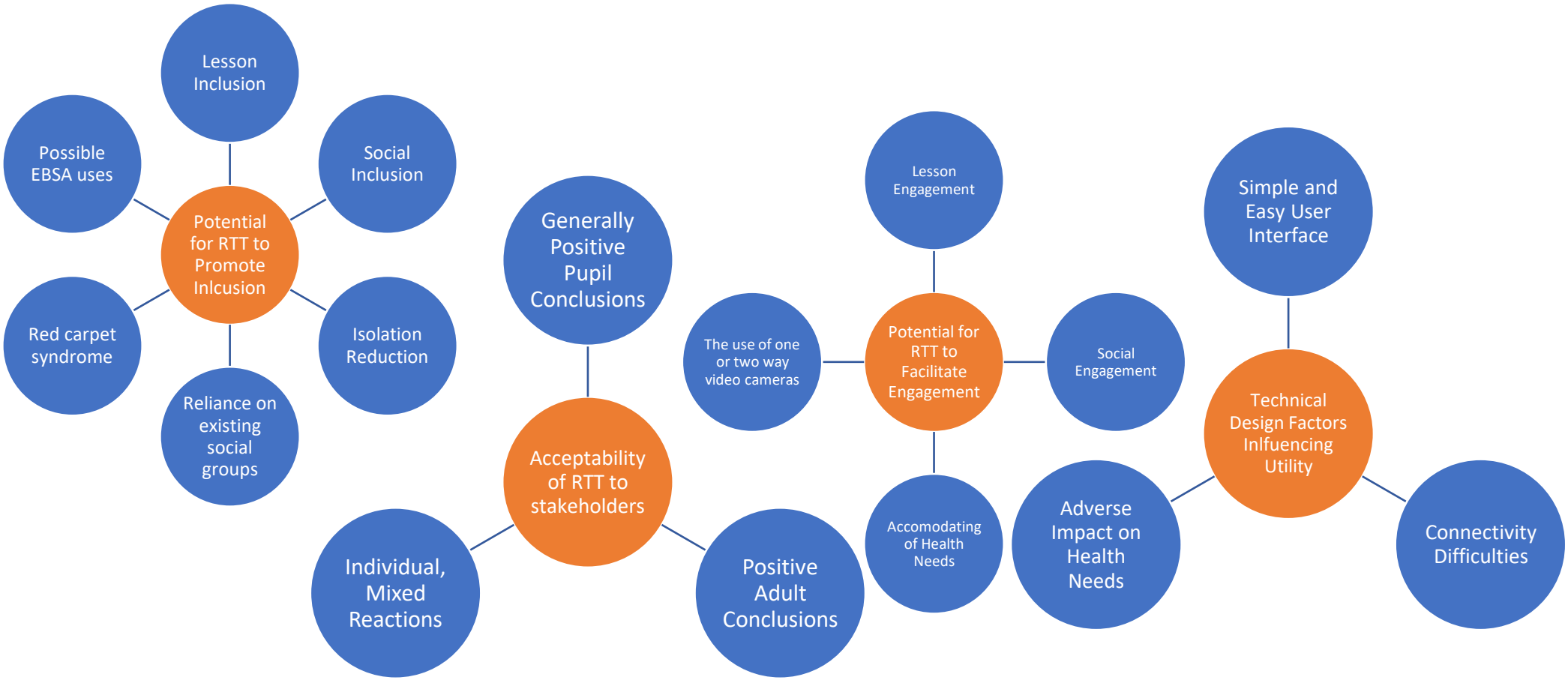
Appendix 5b: Stage 2- Organisation of codes/construction into descriptive themes

Example of Process for Theme 3- Technical design factors influencing utility



Appendix 5c: Stage 3- Development of analytical themes

Illustrative diagram of the final, four analytical themes and their corresponding descriptive themes.



Appendix 6: Supporting Letter to Educational Psychology in Practice for Paper Two

Hi [redacted],

We hope you're well and don't mind us emailing about this. We just wanted to email regarding a query around a potential new submission for EPiP's consideration.

We have finalised our research paper, leading on from our previously accepted EPiP paper which was published in January (User perspectives of robotic telepresence technology in schools: A systematic literature review).

This new paper reports on the first ever, UK- based empirical research project on the AV1 robot, a device in use across over 45 local authorities, which reports on direct implications for EPs and the introduction of a research/participant informed framework of implementation to support EPs.

Given that this paper provides the findings from 10 participants, as well as the proposed introduction of a framework, the word count is at 6218 (excluding references and one appendix).

Would there been any possibility of us submitting this for your consideration with this slightly higher word count? We are very keen to publish to an EP audience given that it has direct relevance to existing practice and feel EPiP would provide the best opportunity to reach this audience.

We're happy to answer any questions you may have. Thanks for taking the time to read this email.

Best wishes,

Matthew Fletcher, Professor Caroline Bond and Professor Pamela Qualter

Appendix 7: Participant Recruitment Email

Using a virtual learning avatar to support pupils with physical and emotional health needs

Participant Recruitment Email

Dear Sir/Madam,

My name is Matthew Fletcher, a trainee Educational Psychologist on the Doctorate in Educational and Child Psychology at the University of Manchester. I have been commissioned by [redacted] to carry out a research project that aims to explore experiences and opinions regarding the use of the AV1 robot avatars. Please find below the three main questions that are informing my research:

1. How does the use of an AV1 impact on key, child outcomes such as attendance,

   attainment and school belonging?

2. How have AV1s been implemented by schools?

3. How do school teachers/staff perceive the AV1s?

This research will involve gaining the views of school staff who have an AV1 currently in their setting or have previously had an AV1. This will involve an interview with the teacher who has experience of an AV1 being in their setting. The interview will last no longer than an hour and aims to collect their views/experiences of the AV1. All data will be fully anonymised within my research with no personal identifiable information included.

I would be most grateful if this information could be distributed to staff involved with the AV1s to recruit potential participants. If there are any further questions you have, please don't hesitate to contact me. Thank you for taking the time to read this email and I look forward to hearing from you.

Yours Sincerely,

Matthew Fletcher

(Trainee Educational Psychologist- University of Manchester)

Appendix 8: Interview Schedule

MANCHESTER 1824
The University of Manchester

Provisional Interview Questions

Thank you for your interest in this research. This interview is intended to be an informal discussion around your experience of the AV1 avatar because a child within your setting is currently using an AV1 robot avatar or has used an AV1 in the past. You are in control of what you choose to share, we are grateful for any contributions to support our research. Whilst we don't anticipate this interview to cause any intentional distress, if we become concerned for your well-being, for example if a discussion triggers an uncomfortable memory/thought for you, we will make sure to contact the link school staff member who may reach out to you to ensure you are supported. Your welfare is our priority at all times. You have the right to stop the interview or withdraw at any time.

Please note that the interview schedule is categorised into general areas of discussion. Example questions are provided below each area should they be needed to prompt a discussion. This list is not exhaustive and follow up questions that are not on this list may be asked upon new information/discussion areas shared during the interview.

Verbal Consent Question to ask to Participants: Before we begin, please can you confirm if you consent to participate in this interview? You have the right to say no and withdraw from the project with no explanation needed.

Role/Involvement

- What is your role/involvement within the AV1 project?
- How long have you been involved with the AV1s?

Uses

- How has the AV1 been used within your setting?
- What is the purpose of the AV1?

Impact

- Has the AV1 impacted on attendance and/or attainment for the child?
- Has the AV1 impacted on the child's mental health? (including confidence, belonging, friendships etc)
- Is there anything else that the AV1 has impacted on?

Perceptions

- How is the AV1 perceived by the child and other children?
- How do other school staff perceive the AV1?

- How is the AV1 perceived by parents and the wider school community?

Personal Views

- Do you intend to continue using the AV1 moving forward? If so, how do you intend to use the AV1?
- Would you recommend the AV1 others?
- What is your general view/opinion regarding the use of AV1? What are the benefits/areas for improvement?

Appendix 9: Ethical Approval Document

****Please ensure you read the contents of this message. This email has been sent via the Ethical Review Manager (ERM) system on behalf of the University of Manchester.****

Dear Mr Matthew Fletcher,

Thank you for submitting your amendment request for project: 2021-12784-21587 ; entitled: Using a virtual learning avatar to support pupils with Emotionally Based School Avoidance which has now been approved. Your documentation has been suitably updated to reflect the proposed changes, please ensure you use this documentation.

Please note that if you have submitted revised supporting documents to accompany your amendment request, the approved versions of these are listed in a table below.

Document Type	File Name	Date	Version
Additional docs	Consent Form School	03/12/2021	3
Additional docs	PIS	13/12/2021	4
Additional docs	Risk Assessment Form	13/12/2021	2
Additional docs	Provisional Interview Questions	13/12/2021	3
Additional docs	School Recruitment Email	13/12/2021	2
Additional docs	Updated Data Management Plan	13/12/2021	2
Additional docs	Privacy notice for The Skylark Partnership AV1 Project	17/12/2021	1

Please ensure you read the information on the Research Ethics website in relation to data collection in the COVID environment as well as the guidance issued by the University in relation to face-to-face (in person) data collection both on and off campus.

A word document version of this guidance is also available.

We wish you every success with the research.

Best wishes,

Dr Kate Rowlands

Environment, Education and Development School Panel PGR

Appendix 10: Participant Consent Form

MANCHESTER 1824
The University of Manchester

Participant Consent Form (School)

Using a virtual learning avatar to support pupils with physical and emotional health needs

Consent Form

If you are happy to participate please complete and sign the consent form below

	Activities	Initials
1	I confirm that I have read the attached information sheet (Version 3: Date 13/12/2021) for the above study and have had the opportunity to consider the information and ask questions and had these answered satisfactorily.	
2	I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving a reason and without detriment to myself. I understand that it will not be possible to remove my data from the project once it has been anonymised and formed part of the data set. I agree to take part on this basis.	
3	I agree to the interview being audio recorded via a digital recorder or through a third-party platform for the purpose of transcription. I am aware this recording will be deleted following transcription.	
4	I agree that any data collected (via interview) may be included in anonymous form; in publications/conference presentations, made available to other researchers or published in anonymous form in academic books, reports or journals.	
5	I agree that the researchers/researchers at other institutions may contact me in future about other research projects.	
6	I agree that the researchers may retain my contact details in order to provide me with a summary of the findings for this study.	
7	I understand that there may be instances where during the course of the interview where information is revealed which means that the researchers will be obliged to break confidentiality, and this has been explained in more detail in the information sheet.	
8	I understand that data collected during the study may be looked at by individuals from The University of Manchester or regulatory authorities,	

	where it is relevant to my taking part in this research. I give permission for these individuals to have access to my data.	
9	I agree to take part in this study.	

Data Protection

The personal information we collect and use to conduct this research will be processed in accordance with data protection law as explained in the Participant Information Sheet and the Privacy Notice for Research Participants.

_____	_____	_____
Name of Participant	Signature	Date

[1 copy for the participant, 1 copy for the research team (original)]

Appendix 11: Participant Information Sheet

The University of Manchester

Research Participant Information Sheet (School)

Using a virtual learning avatar to support pupils with physical and emotional health needs

Participant Information Sheet (PIS)

You have been selected to receive this invitation because a child within your setting is currently using an AV1 robot avatar or has used an AV1 in the past. You are being invited to take part in a research study that aims to explore your views and experiences of the use of the AV1 robot avatar. Before you decide whether to take part, it is important for you to understand why the research is being conducted and what it will involve. Please take time to read the following information carefully before deciding whether to take part and discuss it with others if you wish. Please ask if there is anything that is not clear or if you would like more information. Thank you for taking the time to read this.

You should carefully consider all of the information provided below before deciding if you still want to take part in this research study. After reading this information sheet, if you choose not to take part, please inform the research team directly or let the member of school staff who gave you this sheet know, who can then pass this information back to us. If you have any additional queries about any of the information provided, please speak with a member of the research team.

About the research

Who will conduct the research?

This research is being undertaken by Matthew Fletcher, a second year Trainee Educational Psychologist at the University of Manchester.

What is the purpose of the research?

This study aims to explore the use of AV1s and what their impact is. The aim is to explore this to provide further UK based research regarding the AV1s. Not only will this information add further beneficial research to the education field, the information gained from the study may also help UK-based schools to gain a thorough understanding of how to better use the AV1s.

Will the outcomes of the research be published?

The main outcomes of this research will be reported in an academic thesis that forms part of the 'Doctorate in Educational and Child Psychology' course requirements. The anonymised results/data may also be published in the future/used to inform future research.

Disclosure and Barring Service (DBS) Check

The researcher has undertaken all statutory University of Manchester DBS checks and has an up-to-date DBS number that can be provided upon request.

Who has reviewed the research project?

This project has received ethical approval from the University of Manchester's Ethics board.

Who is funding the research project?

Funding has been provided from the DfE Initial Training for Educational Psychologists bid 2020-2022 £15,950 pa bursary.

What would my involvement be?

What would I be asked to do if I took part?

If you wish to participate and the appropriate consent form has been returned via email, you will be invited to participate in an interview to explore your experiences of the AV1 being used within your setting, as well as your general views/experiences of the avatar.

Whilst we don't anticipate the interview to cause any intentional distress, if we become concerned for your well-being, for example if a discussion triggers an uncomfortable memory/thought for you, a pre-arranged member of school staff will be on standby for psychological/well-being support throughout the project. In an instance where we are concerned for your well-being, we will make sure to contact this link staff member who may reach out to you to ensure you are supported. Alternatively, we can also signpost to external support agencies.

What happens if I do not want to take part or if I change my mind?

It is your choice whether you participant in the study. You have the right to withdraw at any time during the research process including after signing and returning the consent form. You do not have to provide a reason for your withdrawal. However, if you choose to withdraw after the data has been collected, it will not be possible to remove your specific data due it being anonymised and not identifiable to the researcher.

Data Protection and Confidentiality

What information will you collect about me?

In order to undertake the research project, we will need to collect the following personal information/data about you via the signed consent form:

- Name

Via the Interview:

- Your experiences/views of the AV1
- Information regarding the use of the AV1

For audio recordings:

- Your interview will be recorded via a password-protected digital recorder (in person, voice only) or via Zoom (online, voice only). If completed in person, all data will be processed solely by the research team. If completed online via Zoom, your personal data will be

processed by Zoom. This may mean that your personal data is transferred to a country outside of the European Economic Area, some of which have not yet been determined by the United Kingdom to have an adequate level of data protection. Appropriate legal mechanisms to ensure these transfers are compliant with the Data Protection Act 2018 and the UK General Data Protection Regulation are in place.

- Any recording will be removed from the digital recorder or third-party platform and stored on the University of Manchester managed cloud system ('P Drive') as soon as possible following the completion of data collection. These recordings will be deleted once transcribed (as per the University's Zoom guidance).

Under what legal basis are you collecting this information?

We are collecting and storing this personal information in accordance with the General Data Protection Regulation (GDPR) and Data Protection Act 2018 which legislate to protect your personal information. The legal basis upon which we are using your personal information is "public interest task" and "for research purposes". For more information about the way we process your personal information and comply with data protection law please see our Privacy Notice for Research Participants.

What are my rights in relation to the information you will collect about me?

You have a number of rights under data protection law regarding your personal information. For example, you can request a copy of the information we hold about you, including audio recordings. This is known as a Subject Access Request. If you would like to know more about your different rights, please consult our privacy notice for research and if you wish to contact us about your data protection rights, please email dataprotection@manchester.ac.uk or write to The Information Governance Office, Christie Building, University of Manchester, Oxford Road, M13 9PL at the University and we will guide you through the process of exercising your rights.

Will my participation in the study be confidential and my personal identifiable information be protected?

The University of Manchester, as Data Controller for this project, takes responsibility for the protection of the personal information that this study is collecting about you. In order to comply with the legal obligations to protect your personal data, the University has safeguards in place such as policies and procedures. All researchers are appropriately trained, and your data will be looked after in the following way:

- Digital Voice recordings will be stored on the University of Manchester's encrypted 'P drive'.
- A university approved transcriber who is bound by a confidentiality agreement will transcribe the recordings, replacing any personal information with pseudonyms.
- Upon receipt of the transcriptions, the original voice recordings will be deleted, and the anonymised transcripts and consent forms will be stored for 5 years (as per University requirements) before being destroyed.

Potential disclosures:

- If, during the study, you disclose information that concerns us about your well-being or health, we will contact the appropriate GP/next of kin to ensure your safety.

- If, during the study, you disclose information that concerns us regarding the safety and/or well-being of children/young people, we have a professional duty to report these concerns in accordance with the University's safeguarding procedures.

- If at any time, information is disclosed regarding illegal activities or intent to commit illegal activities, we are bound by professional guidelines to report these to the appropriate authorities.

- Whilst no adverse effects are predicted to occur from participation in this study, if you feel you need professional support, please contact the Samaritans (116 123) or your local GP for mental health support. As previously discussed a member of staff will also be on standby for psychological support.

What if I have a complaint?

Contact details for complaints

If you have a minor complaint, please contact the researcher's supervisors.

Caroline Bond (Supervisor)- caroline.bond@manchester.ac.uk

Pamela Qualter (Supervisor)- pamela.qualter@manchester.ac.uk

If you wish to make a formal complaint to someone independent of the research team or if you are not satisfied with the response you have gained from the researchers in the first instance, then please contact

The Research Ethics Manager, Research Office, Christie Building, The University of Manchester, Oxford Road, Manchester, M13 9PL, by emailing: research.complaints@manchester.ac.uk or by telephoning 0161 306 8089.

If you wish to contact us about your data protection rights, please email dataprotection@manchester.ac.uk or write to The Information Governance Office, Christie Building, The University of Manchester, Oxford Road, M13 9PL at the University and we will guide you through the process of exercising your rights.

You also have a right to complain to the Information Commissioner's Office about complaints relating to your personal identifiable information Tel 0303 123 1113

What do I do now?

If you have any queries about the study or if you are interested in taking part then please contact the researcher:
Matthew Fletcher- matthew.fletcher-3@postgrad.manchester.ac.uk
If you wish to participate in the research, please send the signed consent form to the researcher's contact address. If the researcher has gathered sufficient participants already, your consent form email will be deleted without being read (to protect your personal information) and you will be notified via an email that we are no longer recruiting participants, thanking you for your interest as well as offering the option to be placed on a reserve list should future participants be required.

This Project Has Been Approved by the University of Manchester's Research Ethics Committee [2021-12784-21587]

Appendix 12: Outline of Researcher's RTA Process

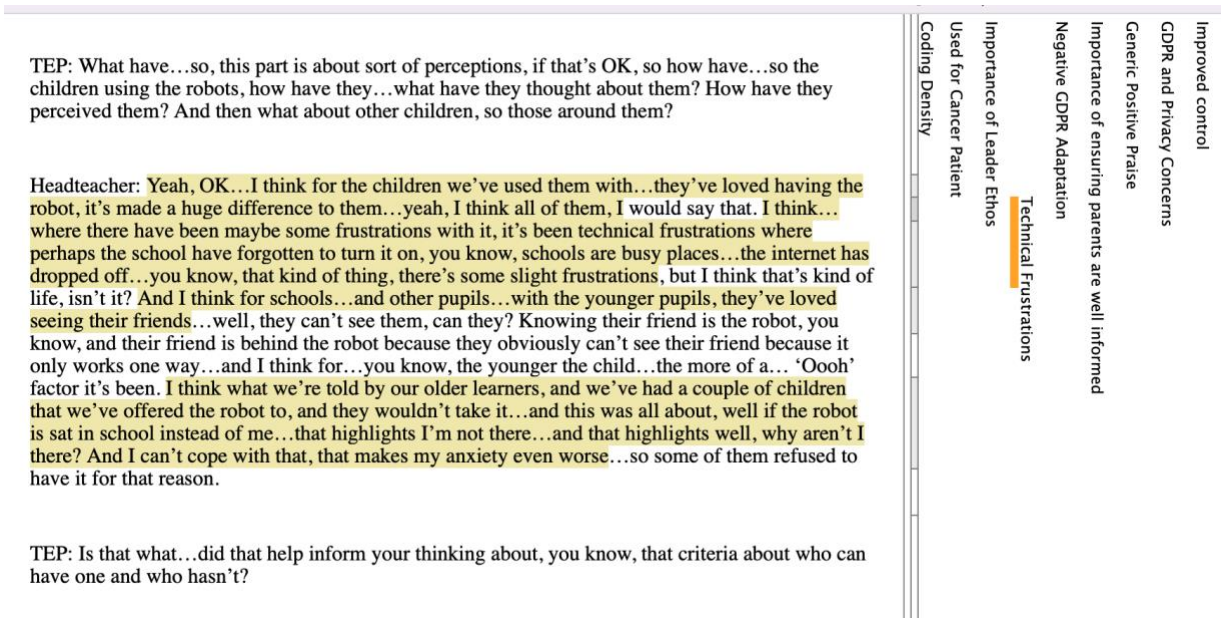
The following section provides an overview of the six stage, reflexive thematic analysis process (RTA, Braun & Clarke, 2022) that the researcher utilised to analyse data gathered from participant interviews.

(1) Familiarising yourself with the dataset

The researcher first became familiar with the dataset by listening to the original interview recordings and reading the interview transcripts multiple times. To support the recording of initial observations/notes about the entire dataset, the researcher also utilised a voice recorder to record initial thoughts and observations after re-reading all transcripts.

(2) Coding

Using NVivo software, the researcher coded the dataset. Interesting aspects of the data, that related to the research question, were recorded as codes. The coding process was completed several times to ensure that the researcher had captured and collated all relevant aspects of the data that linked to the research question. Coding was completed inductively, allowing the dataset to direct the coding process. The researcher utilised a combination of both semantic coding (reviewing explicit data content) and latent coding (reviewing implicit concepts from the data) to maximise the likelihood of addressing the research question. An example of the NVivo coding process is provided below.



(3) Generating initial themes

Following coding, the researcher began to generate initial themes that reflected the dataset. This process was completed by the researcher reviewing codes and collating them together to consider their viability as a potential theme. See below for an example of the researcher using NVivo and Microsoft Word to group codes into potential, generated themes.

Data Extract Examples	Codes	Potential Theme/Sub Themes
It's cost effective…and I think for a couple of our young people…the lad who eventually was accessing most of his learning through the robot, if I'd have to put a teacher in there…it would have cost a bomb! So in terms of cost of robot, plus maintenance cost…you compare that with a price of a teacher doing all of that…it's a no-brainer. So cost effective and cost is definitely a major, major factor for schools nowadays they're a significant cheaper cost than if they were off site doing outdoor ed or something	Cost Effective for some schools Cost influence on school decision making	**The impact of socio-economic differences** • **Device Cost** • **Funding dependency** • **Wi-Fi dependency**
Yeah…but I just think, you know, they are expensive, and I think that's probably the thing that puts schools off, you know, it's a massive expenditure and at the moment I suppose the only…another thing is that I gather the robots are quite expensive, they're like £3,000, £4,000 or something… The only downside to the robot is the fact that you have to buy it for a three month commitment. But a Kindle, a Kindle that's like £50, £60…	Expensive for other schools Cost impact prevents access to AV1 for poorer families/schools	

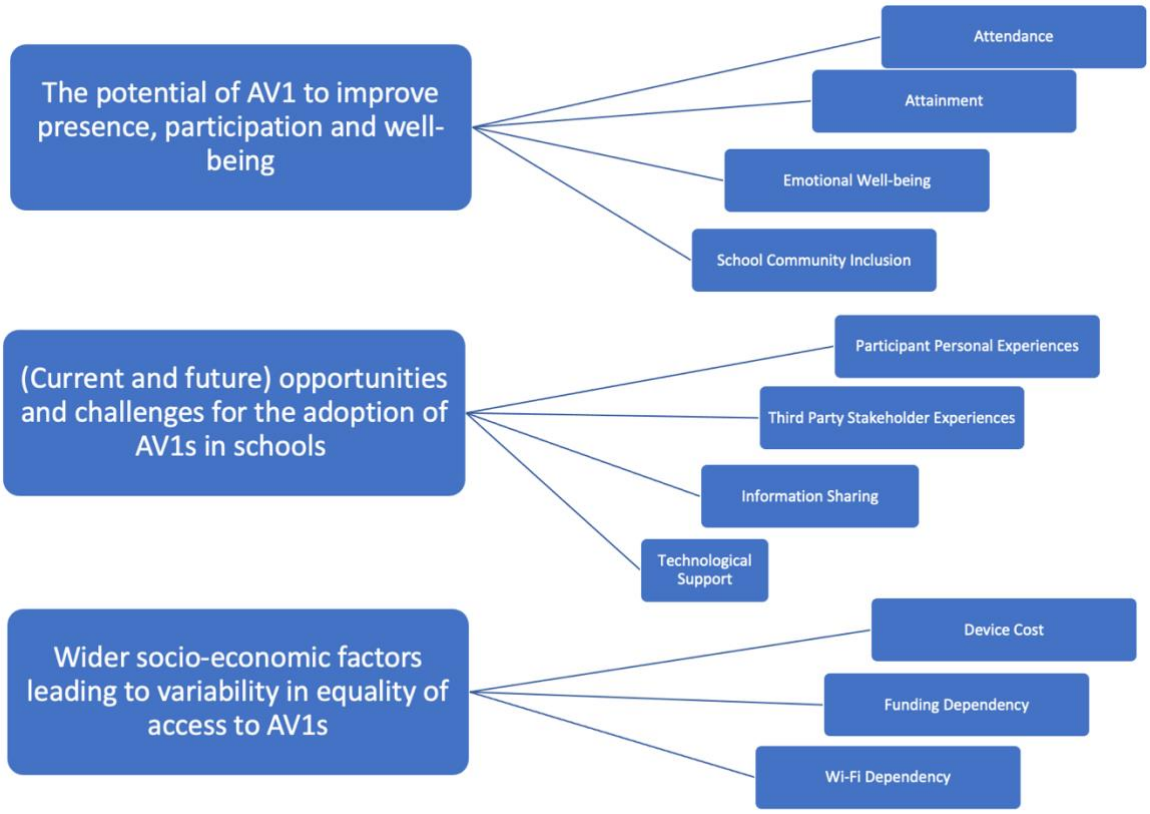
(4) Developing and reviewing themes

The researcher compared the generated themes against the original dataset to establish whether the proposed themes both reflected the dataset and also sufficiently addressed the research question. Alongside this, the researcher met regularly with their

supervisors, discussing their generated themes, to further promote a reflective approach to this stage of the process.

(5) <u>Refining, defining and naming themes</u>

The researcher then created a detailed analysis of each generated theme, supporting the 'storytelling' process that RTA promotes. This stage also included the researcher defining/editing the name of each theme to ensure it accurately represented the focus and content of each theme. A thematic map was generated by the researcher to support this process (see below).



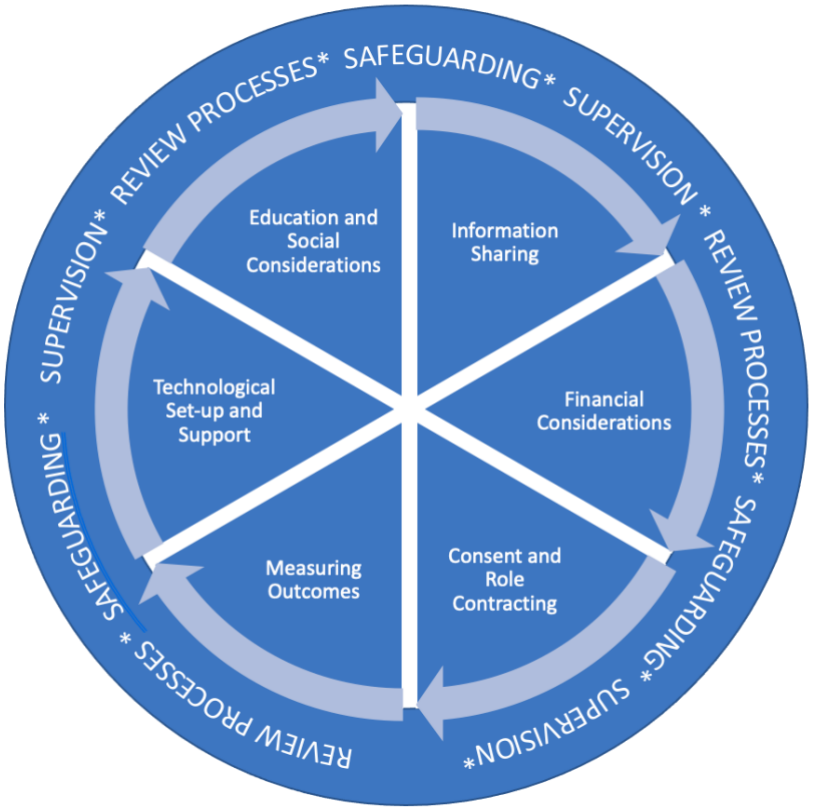
(6) <u>Writing up</u>

Following completion of all the stages discussed above, the researcher utilised a combination of specific data extracts and narrative statements to weave together an analytical discussion of the dataset (see Paper Two).

Appendix 13: Proposed AV1 Implementation Framework

Introduction

This framework has been designed to be used by any practitioner e.g., school staff, EP, LA staff, who are intending to implement the AV1 within their field/support the implementation of the device. The purpose of the framework is to provide a thorough and rigorous approach to implementation, accounting for potential areas of difficulty. This in turn, will help to increase the likelihood of the device being successfully implemented, leading to better outcomes for the pupils using the device.



Measuring Outcomes

How will key outcomes such as attendance and attainment be measured?

How will emotional-based outcomes be measured? E.g., pupil confidence, responsiveness to the device, engagement in school, interactions with peers etc.

What will these outcomes be used for? E.g., for research, to review the effectiveness of the AV1 etc.

Technological Set-up and Support

How will school/home be supported with setting up the device?

How will ongoing IT support be provided for all parties?

How will No Isolation be utilised as part of this IT support?

How will school/home adhere to the No Isolation user guides for the device?

Education and Social Considerations

How will lessons/teaching be adapted in consideration of the AV1?

What support will staff need to be able to make these adaptations?

What considerations will be made for more practical subjects such as Art/PE?

What support will home need in regards to teaching/adaptations?

How will social opportunities for the pupil be arranged using the AV1? e.g., playtime.

How often will the pupil use the device?

What considerations will be made for AV1 use during school holidays/outside of school hours?

Information Sharing

How will the AV1 be introduced to all parties?

How will concerns be alleviated e.g., around security and privacy?

How will parties be signposted to further information about the AV1?

What lines of communication will be established for all parties?

Financial Considerations

How will the AV1 be funded?

Will school require support around Wi-Fi cost/Wi-Fi strength?

Will home need to be supported around purchasing a computer tablet and Wi-FI?

What support can be provided around reducing financial costs for all parties? e.g., the use of bursaries.

Consent and Role Contracting

How will fully informed consent be gathered from all parties?

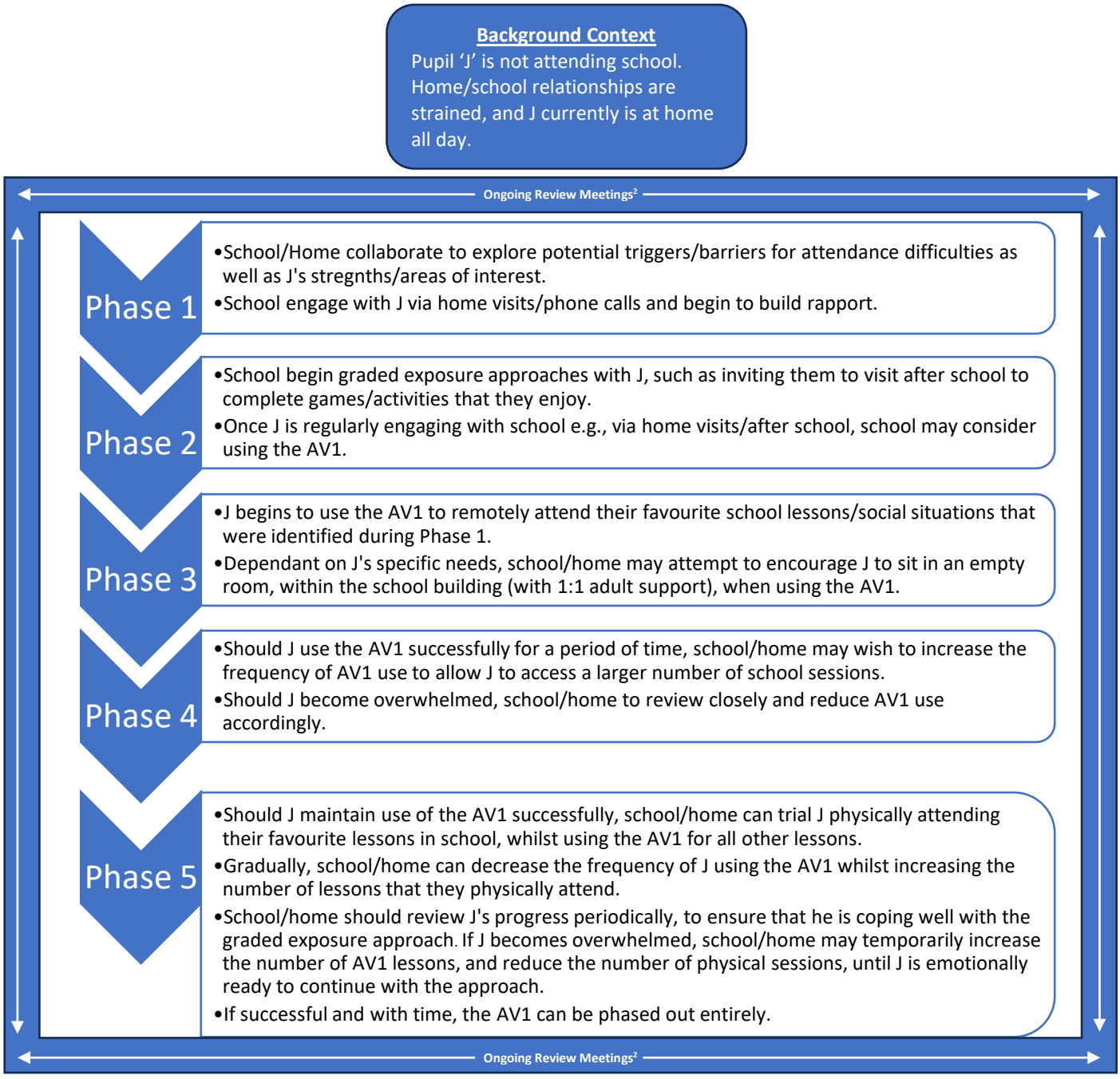
How will roles be identified and agreed? E.g., point of contact for support, those responsible for liaising with No Isolation etc.

How will the AV1 be contracted? E.g., the length of time using the AV1, the purpose of using it, social/education considerations etc.

How will the young person's views/opinions be collected and involved through the entire process?

Appendix 14: Example AV1 EBSA Reintegration Plan

The diagram below was created by the researcher to provide an example of the AV1 and its potential use within an EBSA case. The use of the AV1 could be trialled within EBSA casework, as part of a graded exposure therapeutic approach[1] which ultimately aims to reintegrate a pupil back into an education setting. *Please note that this example is illustrative only, devised by the researcher, and requires future research to explore its validity as a potential approach.*



[1]Graded exposure therapy refers to exposure-based therapeutic approaches that aims to gradually expose a pupil to the school environment, in sequenced stages to promote acclimatisation and reduce anxiety/phobia-related barriers to attendance (Elliott & Place, 2019).

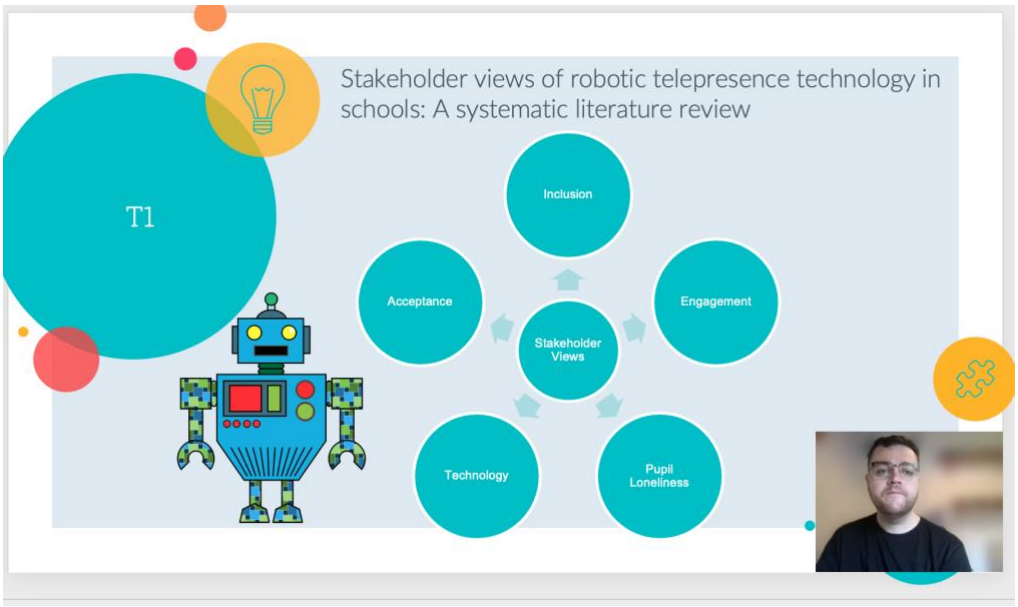
[2]Ongoing review meetings should be routinely held between school/home to monitor the wider context around the pupil. For example, any changes within the family context (e.g., parental illness) or school context (e.g., bullying) should be reviewed, to further explore push/pull factors that may be contributing towards non-attendance. These factors can then be considered when planning support for the pupil.

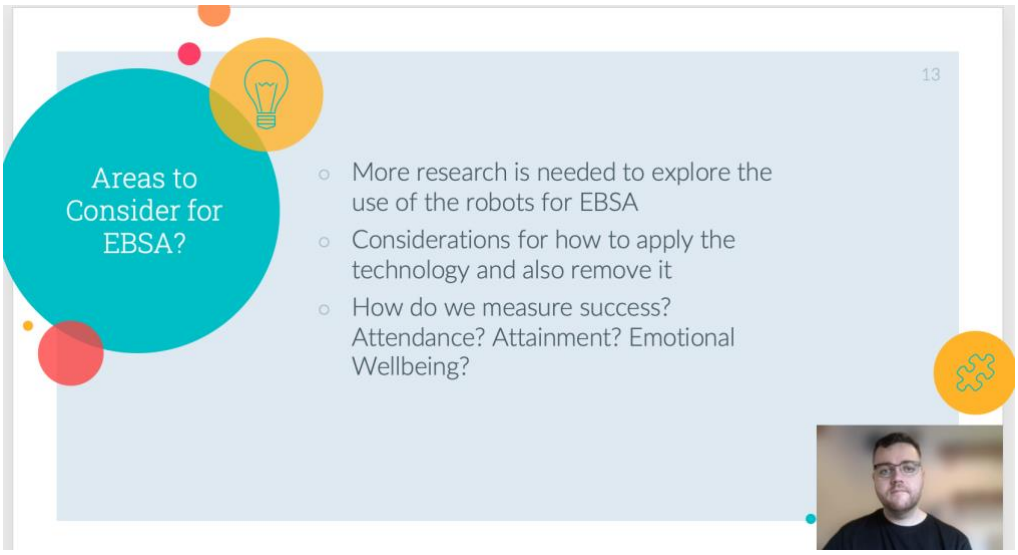
Reference

Elliott, J. G., & Place, M. (2019). Practitioner review: school refusal: developments in conceptualisation and treatment since 2000. *Journal of Child Psychology and Psychiatry, 60*(1), 4-15. https://doi.org/10.1111/jcpp.12848

Appendix 15: Dissemination Twitter Post of DECP paper

Appendix 16: Extract from Cross-Cohort Day Presentation Slides





Appendix 17: Extract from Year 2 Lecture Slides

My T1 Journey

Matthew Fletcher

Golden Thread

- Think about your 'golden thread' that links your thesis together.
- Seeing your end goal can help to shape where you start/your T1 analysis-although there can be bumps along the way!

T1

- No UK Av1 papers?
- Only a small amount of AV1 international papers?
- Lots of general robot research!

T2

- Exploring the AV1 robot in the UK
- Exploring its impact on child outcomes

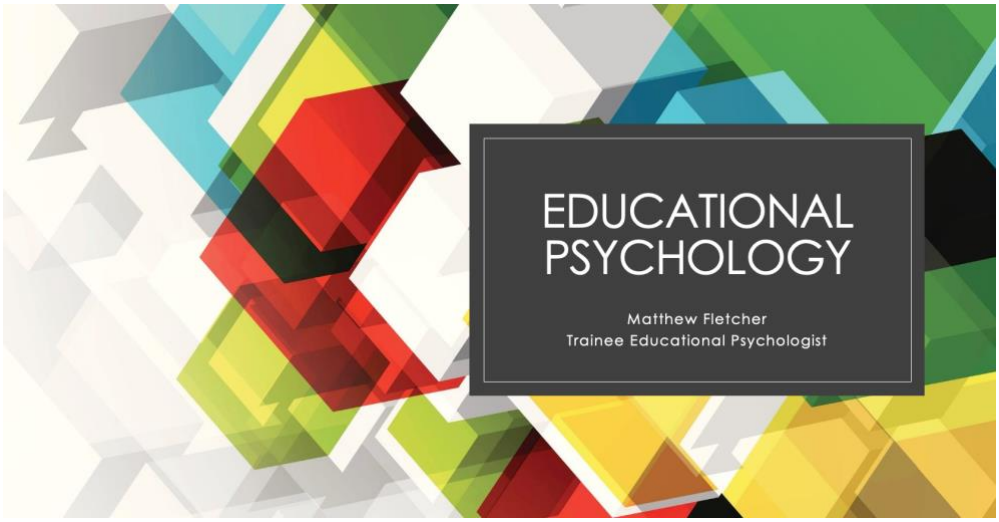
T3

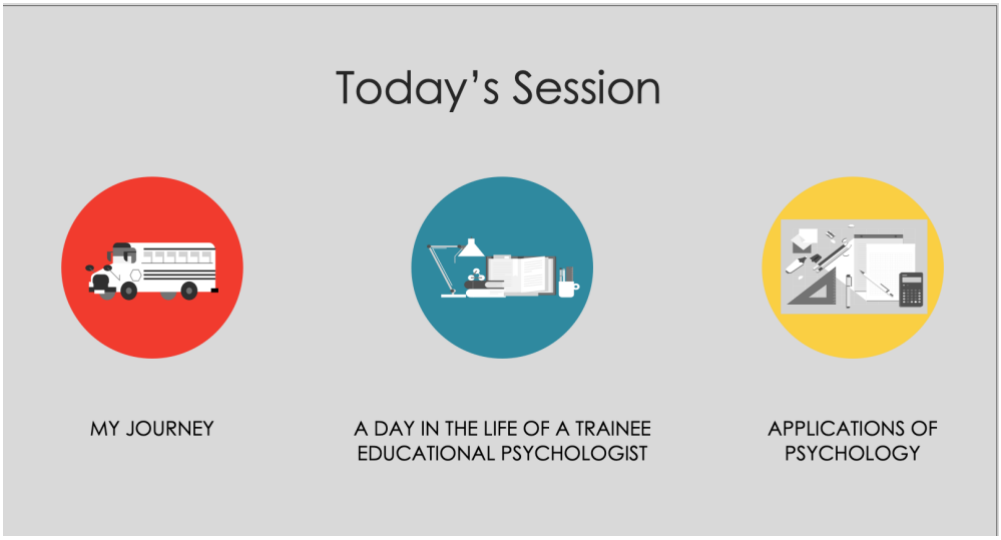
- Research dissemination with Greater Manchester (my commissioner)
- Feedback to the AV1 company- No Isolation

User perspectives of robotic telepresence technology in schools: A systematic literature review

- There was a gap in the research around the collation of user perspectives around robotic devices.
- Lots of small case studies and lots of different robots in use
- Existing papers highlighted the need for SLRs, moving past existing scoping reviews
- The UK is already using these devices for a specific purpose-another reason I chose SLR over a scoping review.
- My question- 'What are user perspectives about robotic telepresence technology in schools?'

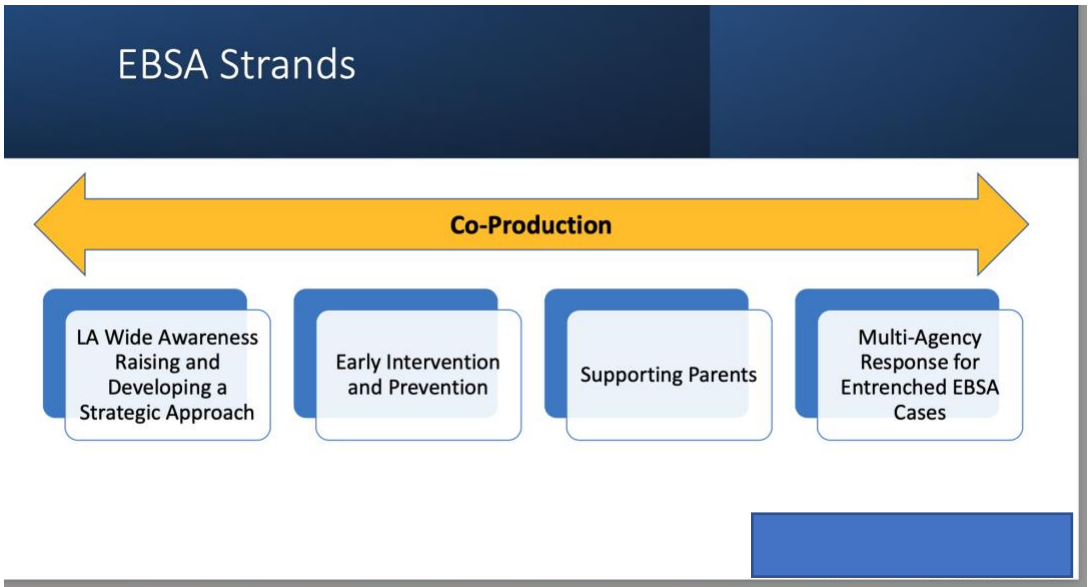
Appendix 18: Extract from Secondary School Presentation Slides

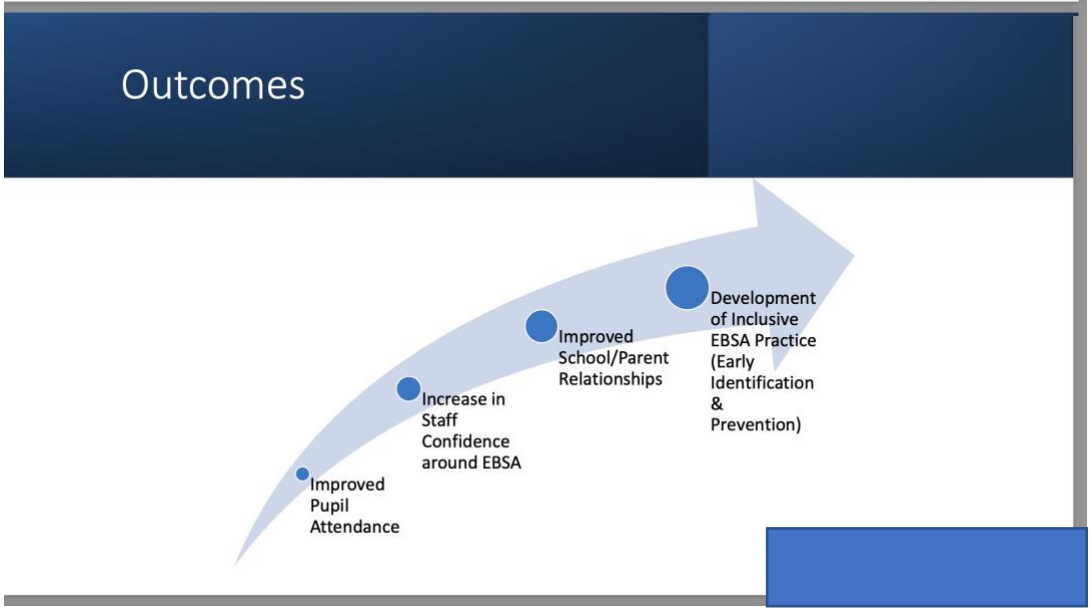




Appendix 19: Extract from LA EBSA Proposal Presentation Slides

[redacted] - Educational Psychologist
Matthew Fletcher – Trainee Educational Psychologist





Appendix 20: Dissemination Twitter Post of Paper One Publication

Pinned Tweet

Matthew Fletcher @TEPmatthew · Jan 20

Excited to see our paper published today that reviews research around robot technology in schools! 🤖 So many potential applications and there's even a guest appearance of @_noisolation AV1 robot! I hope you enjoy reading! tandfonline.com/doi/full/10.10...

EDUCATIONAL PSYCHOLOGY IN PRACTICE
https://doi.org/10.1080/02667363.2022.2155932

Routledge
Taylor & Francis Group

Check for updates

User perspectives of robotic telepresence technology in schools: A systematic literature review

Matthew Fletcher, Caroline Bond and Pamela Qualter

Doctorate in Educational and Child Psychology, School of Environment, Education and Development, University of Manchester, Manchester, UK

ABSTRACT

There is a growth in the use of robotic telepresence technology, allowing users to remotely access an environment, to support the inclusion/attendance of school pupils experiencing physical/emotional difficulties in the UK. Educational psychologists (EPs) are likely to encounter robotic telepresence technology due to their role in supporting pupil inclusion. Despite the Department for Education exploring this technology as a form of alternative provision, there is a lack of research exploring perceptions around robotic telepresence technology. The current review explores perspectives of users. Database searches were conducted between July 2021 and September 2021, identifying studies published within the last ten years. Eleven papers met the inclusion criteria. The review identified four inductive themes: potential for robotic telepresence technology to promote inclusion; potential for robotic telepresence technology to facilitate engagement; technical design factors influencing utility; and acceptability of robotic telepresence technology to users. Findings are discussed alongside implications for educational psychologists/future research.

KEYWORDS

Telepresence; robotic avatar; user perspectives; emotional based school avoidance; physical/emotional health; schools

Appendix 21: Extract from Research Video Blogs