Sheffield Hallam University

Children and young people's preferences and needs when using health technology to self-manage a long-term condition: a scoping review

COURT, Rosemary Jane <http://orcid.org/0009-0001-7721-8855>, SWALLOW, Veronica, EL-YOUSFI, Sarab, GRAY-BURROWS, Kara, SOTIR, Fiona, WHEELER, Gemma, KELLAR, Ian, LEE, Jia Mang, MITCHELL, Robyn, MLYNARCZYK, Wiktoria, RAMAVATH, Arnav, DIMITRI, Paul, PHILLIPS, Bob, PRODGERS, Lucy, POWNALL, Madeleine, KOWALCZYK, Marcin, BRANCHFLOWER, Jacob, POWELL, Lauren, BHANBHRO, Sadiq, WEIGHALL, Anna and MARTIN-KERRY, Jacqueline

Available from Sheffield Hallam University Research Archive (SHURA) at:

https://shura.shu.ac.uk/34138/

This document is the Published Version [VoR]

Citation:

COURT, Rosemary Jane, SWALLOW, Veronica, EL-YOUSFI, Sarab, GRAY-BURROWS, Kara, SOTIR, Fiona, WHEELER, Gemma, KELLAR, Ian, LEE, Jia Mang, MITCHELL, Robyn, MLYNARCZYK, Wiktoria, RAMAVATH, Arnav, DIMITRI, Paul, PHILLIPS, Bob, PRODGERS, Lucy, POWNALL, Madeleine, KOWALCZYK, Marcin, BRANCHFLOWER, Jacob, POWELL, Lauren, BHANBHRO, Sadiq, WEIGHALL, Anna and MARTIN-KERRY, Jacqueline (2024). Children and young people's preferences and needs when using health technology to self-manage a long-term condition: a scoping review. Archives of Disease in Childhood, 109 (10), 826-835. [Article]

Copyright and re-use policy

See http://shura.shu.ac.uk/information.html

Sheffield Hallam University Research Archive
http://shura.shu.ac.uk

OPEN ACCESS

Children and young people's preferences and needs when using health technology to self-manage a long-term condition: a scoping review

Rosemary Jane Court ,[1] Veronica Swallow,[2] Sarab El-Yousfi,[3] Kara Gray-Burrows ,[4] Fiona Sotir,[3] Gemma Wheeler,[5] Ian Kellar ,[6] Jia Mang Lee,[7] Robyn Mitchell,[8] Wiktoria Mlynarczyk,[8] Arnav Ramavath,[8] Paul Dimitri ,[9] Bob Phillips,[10,11] Lucy Prodgers ,[12] Madeleine Pownall,[12] Marcin Kowalczyk,[13] Jacob Branchflower,[5] Lauren Powell,[14] Sadiq Bhanbhro,[15] Anna Weighall,[14] Jacqueline Martin-Kerry [16]

► Additional supplemental material is published online only. To view, please visit the journal online (https://doi.org/10.1136/archdischild-2023-326044).

For numbered affiliations see end of article.

Correspondence to
Rosemary Jane Court;
r.court@shu.ac.uk

Received 4 July 2023
Accepted 27 May 2024
Published Online First
14 August 2024

ABSTRACT

Background The use of patient-facing health technologies to manage long-term conditions (LTCs) is increasing; however, children and young people (CYP) may have preferences about health technologies which they interact or engage with, that influence their decision to use these technologies.

Aims To identify CYP's reported preferences about health technologies to self-manage LTCs.

Methods We undertook a scoping review, searching MEDLINE, PsycINFO and CINAHL in July 2021. Searches were limited to papers published between January 2015 and July 2021. We included any health technologies used to manage physical and mental LTCs. Qualitative content analysis of study data was undertaken to categorise data into themes and quantitative data were described and visually represented. We engaged CYP with LTCs to support the review design, interpretation of findings and development of recommendations.

Results 161 journal articles were included, describing preferences of CYP. Most included studies were undertaken in high-income countries. CYP's main preferences and needs were: design and functionality; privacy and sharing; customisation and personalisation of the technology; and interaction options within the technology.

Conclusions This review highlights important preferences and needs that CYP may have before using technologies to self-manage their LTC. These should be considered when developing technology for this population. Future research should involve CYP throughout the development of the technologies, from identifying their unmet needs through to final design, development, evaluation and implementation of the intervention.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Healthcare is increasingly incorporating technology to support children and young people (CYP) to self-manage their long-term conditions (LTCs).
⇒ Involving CYP meaningfully in all stages of technology development and evaluation is necessary to ensure technologies are appropriate, but this does not always happen.
⇒ Our previous review identified key concerns that CYP with LTCs have when using technologies; labelling and identity; accessibility; privacy and reliability; and trustworthiness.

WHAT THIS STUDY ADDS

⇒ We have identified key preferences that CYP have about health technologies to self-manage LTCs.
⇒ Preferences included design and functionality; being able to balance privacy and sharing; the option to customise and personalise the technology; and interaction options within the technology.
⇒ It is important to understand the preferences of CYP to enable engagement with health technologies and enhance end-user experience and acceptability of new devices and digital platforms.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ We report the importance and process of meaningful involvement of CYP in a scoping review to support future teams undertaking reviews about topics that impact CYP.
⇒ When developing technologies for CYP to support them in managing their LTCs, CYP's preferences and needs should be considered to help increase CYP engagement with the technologies.
⇒ The co-produced recommendations provide clear guidance for technology developers about how to involve CYP; these also build on our previous published recommendations.

Check for updates

© Author(s) (or their employer(s)) 2024. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

To cite: Court RJ, Swallow V, El-Yousfi S, *et al*. *Arch Dis Child* 2024;**109**:826–835.

BACKGROUND

Healthcare is increasingly incorporating technology into patient care, using telehealth, artificial intelligence (AI), virtual reality (VR), devices and smartphone applications (apps). While technology is also being used by children and young people (CYP) and families, their preferences and what they find appealing about it remain unknown. Our previous

Arch Dis Child: first published as 10.1136/archdischild-2023-326044 on 14 August 2024. Downloaded from http://adc.bmj.com/ on October 2, 2024 at Sheffield Hallam Uni Consortia. Protected by copyright.

Table 1 Eligibility criteria for studies

Inclusion criteria	Exclusion criteria
Population: CYP with physical and/or mental LTCs aged up to and including 18 years (no lower age limit). LTCs were defined as 'those conditions for which there is currently no cure, and which are managed with drugs and other treatments'.[145] **Concept:** preferences that CYP have about health technologies and any positive elements that they look for when using health technology. Also, any information that CYP want or need to know before using health technology. **Context:** the focus was on health technologies that CYP engage with or use to manage LTCs. Health technologies included mobile/smartphone apps; virtual reality; telehealth/telemedicine; digital health; medical devices (digitised); gamification/health gaming; augmented reality; receiving health information via SMS (digital health education messages); wearables for monitoring and patient care; remote monitoring; consumer products (eg, FitBits); and social media including patient blogs. All settings (eg, home, hospital and clinic) and all countries were included. **Study design:** qualitative, surveys, questionnaires, feasibility, acceptability, user testing/usability and mixed methods (including any of these designs undertaken within trials), where data from those 18 years or younger could be extracted.	Studies were excluded if they: 1. Did not involve CYP with LTCs 2. Only explored parents' or clinicians' views, experiences, use or preferences about health technology without including CYP's views 3. Explored the use of health technology to manage acute conditions, diagnosis or for a one-off measurement 4. Involved students in a school setting using health technology rather than children or young people with an LTC 5. Included technologies to enhance mobility, senses or provide medications (eg, hearing aids, mobility aids, prostheses) 6. Exclusively included CYP aged over 18 years 7. Were published before 2015 (to ensure we only included technology that is relevant to current technology used) 8. Did not separate CYP's and adults' data within the study 9. Were conference abstracts or protocols 10. Were not written in English.

apps, applications; CYP, children and young people; LTCs, long-term conditions.

review[1] on CYP's concerns about health technology found many studies overlook CYP in designing, developing, evaluating and implementing health technologies. CYP who were involved in the previously reviewed studies expressed concerns about labelling and stigma, privacy and reliability, accessibility and trustworthiness.[1] The aim of this current review was to identify studies that included CYP's preferences about health technologies to self-manage long-term health conditions (LTCs), and to co-develop with CYP recommendations for technology developers and researchers in consultation with CYP as advisors.

METHODS

We undertook a scoping review in line with guidance by Khalil *et al 2016*, which updated the original scoping review guidance developed by Arksey and O'Malley by incorporating further guidance by Levac *et al* 2010 and the Joanna Briggs Institute.[2–5] We followed guidance to inform data analysis and charting.[6] Our protocol is available.[7]

Search strategy

We searched Ovid MEDLINE, PsycINFO and CINAHL (July 2021) using a strategy developed with an information specialist, modified for each database (online supplemental file 1). To ensure that the literature reviewed was relevant to current health technologies, searches were limited to papers published in January 2015–July 2021, reflecting the publication of two key documents in 2015.[8 9]

Eligibility

Table 1 outlines inclusion and exclusion criteria.

Study selection

Records were de-duplicated in EndNote and managed in Rayyan for title and abstract screening. Two searches were undertaken (2019 and 2021). Six reviewers (RJC, IK, KG-B, JML, VS, MP) screened in pairs, independently undertaking title and abstract screening for records in search 1. For search 2, records were categorised by Rayyan in terms of probability of relevance according to decisions made in screening for search 1. Studies with ≤30% probability of being relevant were excluded; those with 50% probability were single screened (JM-K) and those with ≥70% probability were double-screened (JM-K, IK). Full texts were screened independently in Covidence by two reviewers (JM-K, SE-Y, RJC, MK or JML). When uncertainty arose, articles were discussed until a consensus was reached.

Data extraction and analysis

Data were extracted by SB, JML, JMK, SE-Y, LPr, FS, LPo, AW, GW, MK, JB with FS checking 10% of studies. Data extracted included: lead author; publication year; country; study participant details (age, number, sex, ethnicity, LTC); study design; technology type; setting; retrospective/prospective use; preferences and needs; whether CYP were involved in the scoping/design of the technology; and quotations to support preferences.

Content analysis was undertaken[10] as recommended.[6] JM-K read through and coded extracted data (quotations and interpretation from the primary study authors) to categorise data into four overarching themes. Themes were reviewed by VS and discussed with the wider team.

Stakeholder consultation

We convened a Patient and Public Involvement (PPI) Advisory Group of 12 CYP with LTCs in England. Regular 60-minute online workshops, using Zoom and Miro, enabled CYP's contribution to the review's focus, interpretation of findings and co-development of recommendations. We met with the young people at key time points in the study. Five meetings were held at approximately 2-month intervals. Early sessions focused on developing PPI members' understanding of a review process, building skills in critiquing and discussing research findings through exploring recommendations of our previous review.[1] Workshops built upon understanding and ideas generated previously, with members empowered to work with facilitators to draft the review's recommendations. Attendees received a £20 thank-you voucher after each workshop; minutes were distributed to the entire PPI group for further mutual learning, particularly for those who missed a session due to illness or healthcare appointments.

RESULTS

Study selection

Electronic searches identified 22 063 unique records. Many excluded papers did not include preferences, did not separate CYP participant responses from those of adults or reported technology outside the review's scope. 161 papers were included

Arch Dis Child: first published as 10.1136/archdischild-2023-326044 on 14 August 2024. Downloaded from http://adc.bmj.com/ on October 2, 2024 at Sheffield Hallam Uni Consortia. Protected by copyright.

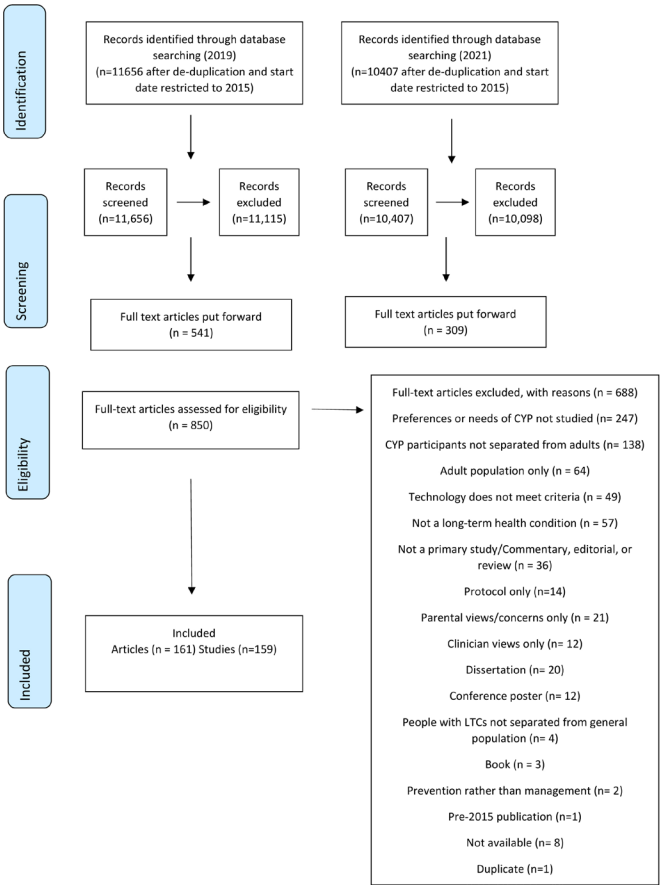

Figure 1 PRISMA flow chart. CYP, children and young people; LTCs, long-term conditions; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analysis.

(figure 1) representing 159 studies. Details of the 161 papers are provided (online supplemental file 2).

Characteristics of included studies

Studies were published between 2015 and 2021 (figure 2), undertaken in the USA (n=62), the UK (n=23), Canada (n=18), Australia (n=14), the Netherlands (n=7), Brazil (n=6), New Zealand (n=4), China (n=3), Denmark (n=3), Spain (n=3), Sweden (n=3), Finland (n=2) and Norway (n=2), and one study each in Korea, Estonia, France, Ireland, Japan, Korea, Nigeria, Greece and Turkey.

Studies included CYP with the following LTCs (online supplemental table 1): type 1 diabetes mellitus (n=22); mental health conditions including depression, anxiety, post-traumatic stress disorder, early-onset psychosis and unspecified mental health conditions requiring access to mental health services (n=26); cancer (n=20); asthma (n=17); obesity (n=7); juvenile idiopathic arthritis (n=6); attention deficit hyperactivity disorder (n=4); autism spectrum disorder/conditions (n=4); spina bifida (n=3); cerebral palsy (n=3); cystic fibrosis (n=3) and various other LTCs (n=44). Most studies focused on one LTC without reporting any comorbidities. One study included CYP with concurrent coeliac disease and type 1 diabetes,[11] another included CYP with mental health conditions and comorbid symptoms of insomnia and anxiety disorder,[12] and one study included CYP with autism spectrum disorder and depression[13] Studies included CYP aged 2–18 years; 62 studies included participants under 11 years.[11 14–74] Seven studies included children under 5 years, with parents, caregivers and specialists supporting their preferences.[23 30 33 34 75–77] 99 studies (58%) did not report ethnicity of CYP participants (figure 3A), and of the 133 studies that recorded sex, 65% recorded ≥50% female participants (figure 3B). Two studies included trans and gender-diverse CYP.[78 79]

Many studies were qualitative (n=74) or mixed methods (n=25). Study designs also included user testing (n=11), pilot/feasibility studies (n=28), co-design (n=9), surveys/questionnaires (n=7), randomised trials (n=2), and one each of participatory action research, single-site cohort and community-based participatory design. Technologies were categorised using a typology[80]: internet (eg, websites, forums) (n=10); social media (eg, Facebook, Instagram) (n=10); mobile health (mHealth, for example, mobile phone apps, text messaging, tablets) (n=72); telehealth (eg, video-conferencing, interactive online treatment programmes) (n=18); devices (eg, wearables) (n=5). An additional category was developed to capture immersive/machine-led technologies comprising gaming, AI and VR (n=18). 26 studies[17 22 43 48 50 52 62–64 81–97] involved a combination of technologies.

Preferences and needs expressed by CYP

Defining preferences was challenging; we excluded studies that only reported *satisfaction* or *level of acceptability*, to ensure an in-depth approach to understanding preferences. CYP provided detailed accounts of technology features they liked or preferred. Many preferences were similar across studies (online supplemental table 2). There were four overarching themes, summarised with quotations (online supplemental table 3). Many studies did not report the age and/or sex of the participant who reported the preference.

Design and functionality

CYP reported specific preferences about technology design and functionality. They preferred clearly laid out mobile apps and internet sources, divided into subsections, and well labelled.[20 22–24 37 61 98–104] Ease of use and convenience were important; preferring technology that was ready to use and CYP not needing to search for information.[20 22–24 52 59 77 89 95 99 101–103 105–109] Bright colours were appealing, making them 'feel good' when interacting with the technology.[64 100 110]

CYP expressed interest in using technologies that were present in their daily lives, for example, digital games accessed through smartphones, tablets and computers. Additionally, they valued apps that were accessible across different platforms/operating systems.[27 61 102] Some CYP found it easier to record information using technology.[52] They preferred a balance between technology simplicity and receiving appropriate information enabling them to engage with the technology.[61 102 111] CYP appreciated technology with clear and uncomplicated language, without 'doctory' words or jargon, but not 'too dumbed down'.[70 82 95 100 104 112] They also had preferences about images and multimedia, and for programmes and apps with age-appropriate and developmentally appropriate content incorporating images and media that were relatable.[30 66 69 95 100] Younger children's preferences included background music, visual graphics and manga (Japanese comic) animations.[30 34]

Privacy and sharing

CYP need to balance privacy and sharing when using technology. Most CYP preferred to use technology to interact with, and share, information.[19 20 25 39 52 78 94 99 101 111 113–118] They valued connecting

Arch Dis Child: first published as 10.1136/archdischild-2023-326044 on 14 August 2024. Downloaded from http://adc.bmj.com/ on October 2, 2024 at Sheffield Hallam Uni Consortia. Protected by copyright.

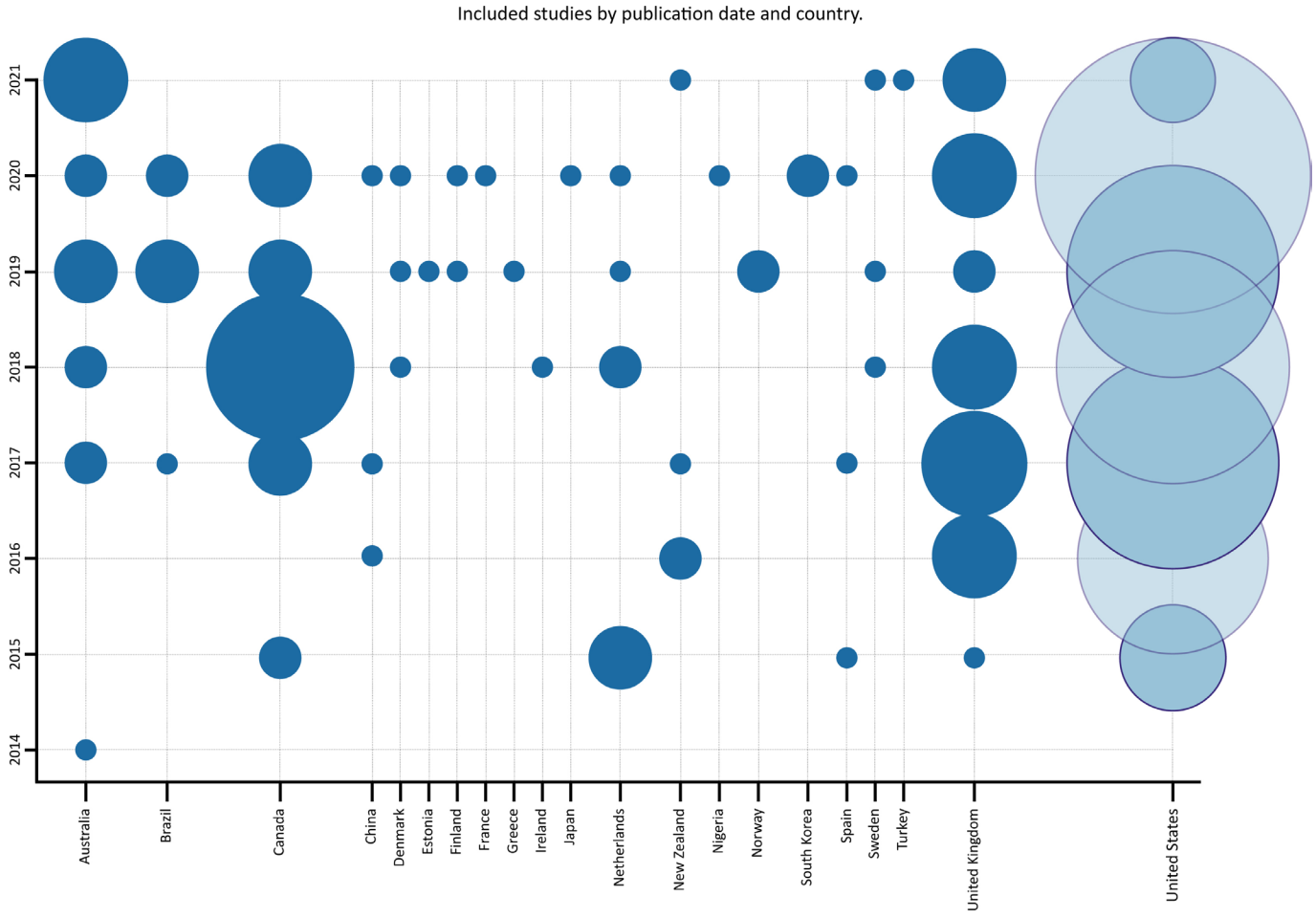

Figure 2 Included studies by publication date and country.

with others with similar conditions or experiences, reducing loneliness and isolation.[19 21 59 62 63 66 72 79 81 82 85 88 89 93–95 97 104 113 117–125] CYP with cystic fibrosis and type 1 diabetes benefited from chat rooms, breaking their isolation and helping them feel less alone.[63 99 104] Immediacy of communication with healthcare professionals and assessment via messaging or video was positive for CYP with asthma, facilitating timely and targeted intervention.[39] Some CYP preferred using technology to communicate, avoiding embarrassment and maintaining independence.[12 79 111 113 118 126 127] They expected security functions in healthcare technologies.[14 66 94 111 124 125 128 129] CYP appreciated technology enabling them autonomy and control over their information.[20 78 90 102 113 130]

Customisation and personalisation

The functionality to customise and personalise technologies was viewed as positive and important.[20 21 49 55 66 78 101 102 105 117 131 132] This included personalising frequency (eg, reminders, text messages), content (eg, asthma triggers relevant for the individual), when and how they used the technology, and tracking their conditions and symptoms.[49 72 77 78 87 88 91 98 105 116 133–140] Being able to set personal goals within the technologies was motivational, providing visual representation of their progress and incentive to achieve.[37 89 113 114 121 133 135] The preference to personalise the technology was reported by CYP with spina bifida, asthma, cancer, type 1 diabetes, depression, sickle cell anaemia and haemophilia.[20 49 78 102 105 117] Younger children's views were well represented; CYP aged 6–17 years appreciated creating their own personalised character.[20 68 87 141] CYP with LTCs with particularly complex medicine regimens, for example, asthma and cystic fibrosis, considered apps with medication reminder functions to be important.[96 98 99 101 142 143]

Interaction

Interaction preferences covered a range of features including gamification within the technology, for example, referring to the 'magical' experience of shooting balloons,[42] noting games within the technology 'provides a distraction and it calms me down'.[78] CYP of different ages valued games, such as goals to incentivise improving their health, providing motivation.[14 62 78 89 114 132] CYP valued incentives and rewards, including financial incentives.[14 54 60] Interestingly, while CYP valued the opportunity to interact with peers with the same condition or with healthcare professionals online, some valued interactive technologies which removed the need for them to speak, viewing communication online as 'less intimidating'.[12 19 20 117] One study reported the positive of visualising personal experiences using avatars lessened the need to talk.[131]

CYP described how interacting with games and customising avatars helped them demonstrate their emotions and express their feelings.[26 87 131] For example, CYP liked the option to add inner voices and emotions to avatars to express their feelings and interpret situations.[131] Some CYP expressed how interaction with technology gave them greater confidence and better understanding about self-management, enabling independence.[21 43 130 131] Immersive technologies were described by some

Arch Dis Child: first published as 10.1136/archdischild-2023-326044 on 14 August 2024. Downloaded from http://adc.bmj.com/ on October 2, 2024 at Sheffield Hallam Uni Consortia. Protected by copyright.

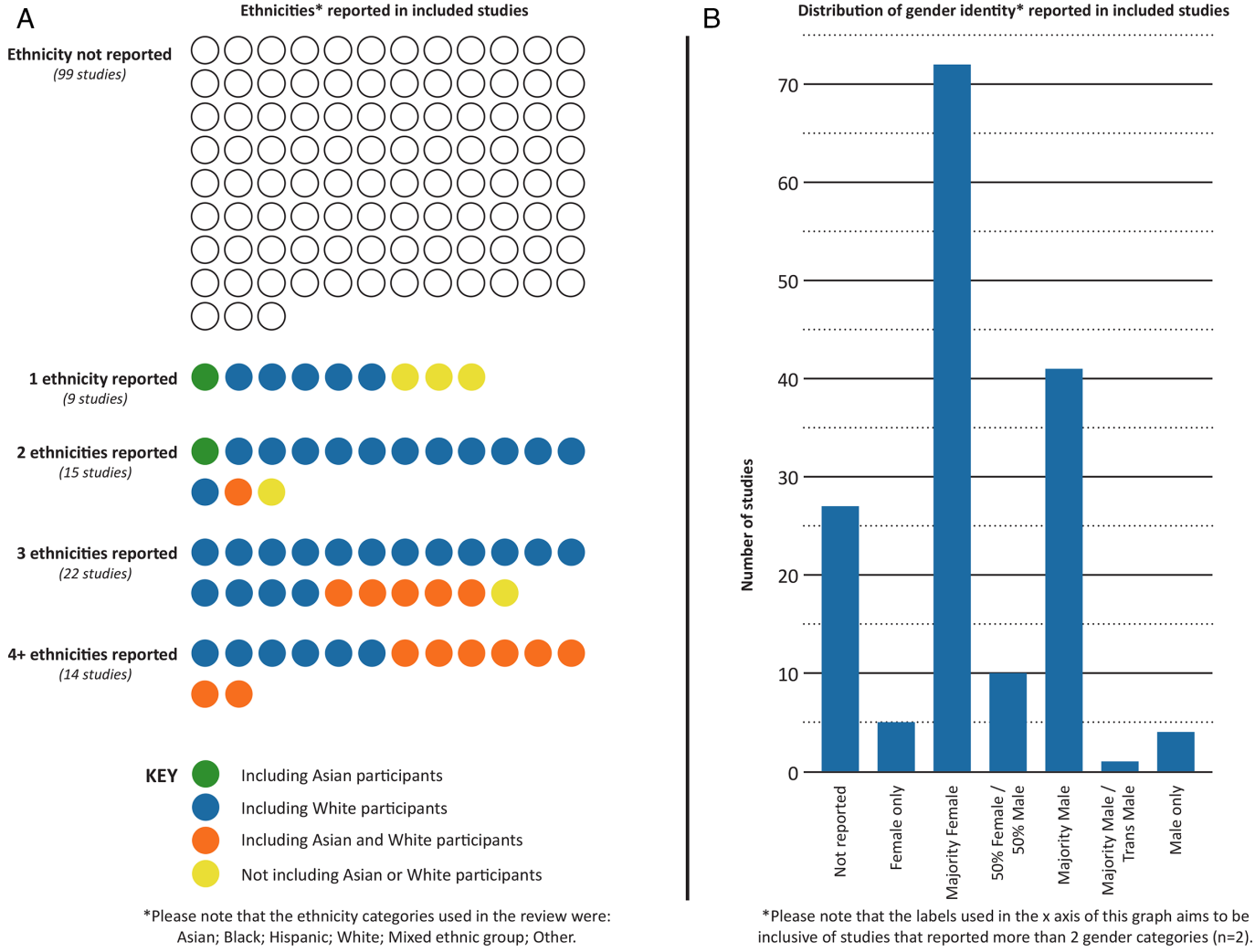

Figure 3 Ethnicities and distribution of gender identity reported in included studies.

as a distraction from what was happening around them,[64 78 144] with VR games an 'exciting distraction' from negative aspects of rehabilitation such as boredom and pain.[42]

Stakeholder consultation

PPI members believed that it was critical to value CYP's unique and expert opinions, separate from those of their parents, caregivers and healthcare professionals. This approach differs from studies excluded from this review that consider adults as proxies for CYP. PPI members contributed to the interpretation of findings, exploring early themes with quotations from CYP. They agreed with the initial findings presented, adding further depth to discussions of privacy, customisation and health technologies' potential impact(s) on the relationship between CYP and their parent/caregiver. The PPI members led the development of the recommendations based on their review of the data and findings. The recommendations were refined over several months between PPI members and the wider team, delivering the final set of recommendations (Box 1).

DISCUSSION

Main findings

This review highlights CYP's preferences and needs for technology to support them to self-manage LTCs, including design and functionality; privacy and information sharing; customisation and personalisation; and interaction. Included studies involved CYP aged 2–18 years, with 39% involving CYP under 11 years. Most studies were conducted in high-income countries, focusing on type 1 diabetes, mental health conditions, cancer and asthma. Studies predominantly recruited CYP with a specific LTC and therefore the views of CYP in these studies may not be representative of the wider CYP population with multimorbidity. Ethnic background was not consistently reported, and participants were predominantly female. Although CYP were reported as being involved in the scoping, design and/or evaluation of the technology in many studies (n=105), their involvement was not always defined and engagement methods were not clearly articulated.

Our findings in relation to the literature

There has been a marked increase in the number of studies involving CYP's use of health technologies to manage an LTC, compared with our previous review.[1] Nonetheless, in the current review, many studies focused on effectiveness of the health technology without asking CYP about their preferences and needs. No review has specifically explored CYP's preferences when using health technology to manage LTCs. Our review suggests a shift in the focus of technologies investigated with fewer studies focusing on internet sites, but with mHealth remaining the most studied technology.

Arch Dis Child: first published as 10.1136/archdischild-2023-326044 on 14 August 2024. Downloaded from http://adc.bmj.com/ on October 2, 2024 at Sheffield Hallam Uni Consortia. Protected by copyright.

Box 1 Recommendations

The following recommendations were derived from our findings and co-developed with CYP stakeholders (recommendations that CYP identified as most important are denoted with an asterisk).

The following recommendations were congruent with the recommendations made in our previous scoping review[1]:

1. Recognise the importance of CYP having their own, unique, expert opinion that is distinct from those of their parents/caregivers and healthcare professionals.*
2. Ensure any technology for use by CYP is age-appropriate and developmentally-appropriate (in terms of language and style).*
3. When designing and developing technology for CYP to manage LTCs, consider the value CYP place on customising/personalising aspects such as characters, reminders and when they choose to use the technology.*

The following recommendations are new and based on this review's findings:

4. When developing and testing technology for CYP, include research that captures in-depth, detailed understanding of what CYP think about the technology (rather than satisfaction or simple acceptability scales).*
5. When undertaking research about CYP's use of technology, consider whether your study participants represent the target end-users of the technology (for example, consider ethnic background, age and other characteristics of CYP participants). Report the characteristics clearly but do not use them to generalise results to specific populations unless appropriate.
6. Carefully consider the appearance of the technology as CYP have particular preferences including it being aesthetically pleasing and user-friendly.*
7. Consider that CYP need a balance between sharing information with peers, but not wanting to share with others (eg, their parents or other CYP). The option of sharing ultimately needs to rest with the individual and the option of anonymity may be preferred by some. Consider that some CYP may prefer the opportunity to interact through technology rather than verbally (eg, in appointments with clinicians).
8. Consider the positive value that CYP place on gamification aspects and incentives when using technology and include this as an option to encourage them to use the technology.

CYP, children and young people; LTCs, long-term conditions.

We developed a new category for this review to encapsulate newer immersive technologies of AI, VR and chatbots which were not included in our previous review; this category now represents approximately 13% of included studies. CYP's preferences appear consistent across all technologies and not specific to a particular technology. Preferences reported by CYP using the newer technologies however did focus on personalisation opportunities within the technology.

We identified a range of preferences and needs of CYP when using health technologies to self-manage an LTC. As in our previous review,[1] we found that CYP wanted to achieve a balance between sharing information with others, for example, CYP with the same LTC, while still ensuring their privacy was maintained and that the technology securely dealt with their information. This is an important consideration for technology developers and researchers and is highlighted in recommendation 7.

Interestingly, CYP reported that using technologies with chat functionality removed the pressure on them to speak (eg, at clinical appointments), which CYP appreciated.[20 39 126] CYP also wanted a balance between clear and colourful websites, with enough well-written and accessible information. Some CYP indicated that independence from parents and technology that was targeted solely at CYP was important.[113]

Strengths and limitations of the review

A strength of this review is its broad focus on technologies and LTCs. We used a recognised methodology,[2 6] ensuring rigour, and worked with CYP throughout the review. We co-developed recommendations based on the review's findings which are important for future development of health technologies for CYP with LTCs. The PPI group have led the focus and outputs of the review which has made the research meaningful and relevant to young people, and the recommendations represent their voice.

A limitation of the primary studies included was lack of diversity. Ethnicity was reported in less than half of studies and the most represented ethnic group was 'white', with Asian CYP particularly under-represented. Sex was not reported in all studies, but where sex was reported, more than half of studies recorded a majority of female participants. Sex was reported as male or female; and only two studies[78 79] reported preferences of trans and gender-diverse CYP. Many excluded studies only explored acceptability/satisfaction with the technology. Meaningful understanding of CYP's preferences is important as these will influence whether CYP use technologies.

Future research

Based on the findings from our review and the recommendations developed with our PPI members, we believe further research should focus on the co-development of a framework to support consistent and appropriate involvement of CYP when new health technology is designed, developed and tested.

Author affiliations
[1]Nursing and Midwifery, Sheffield Hallam University College of Health Wellbeing and Life Sciences, Sheffield, UK
[2]College of Health, Wellbeing and Life Sciences, Sheffield Hallam University, Sheffield, UK
[3]School of Clinical Dentistry, The University of Sheffield, Sheffield, UK
[4]School of Dentistry, University of Leeds Faculty of Medicine and Health, Leeds, UK
[5]NIHR MedTech & In Vitro Diagnostics Co-operative Sheffield Children's Hospital, NIHR Sheffield CRF, Sheffield, UK
[6]Department of Psychology, The University of Sheffield, Sheffield, UK
[7]Hull York Medical School, University of York, York, UK
[8]Patient and Public Involvement (PPI) Group Member, University of York, York, UK
[9]NIHR Children and Young People MedTech Cooperative, Sheffield Children's Hospital NHS Foundation Trust, Sheffield, UK
[10]Leeds Children's Hospital, Leeds, UK
[11]Centre for Reviews and Dissemination, University of York, York, UK
[12]School of Psychology, University of Leeds, Leeds, UK
[13]Medical School, The University of Sheffield, Sheffield, UK
[14]School of Education, The University of Sheffield, Sheffield, UK
[15]Health Research Institute, Sheffield Hallam University, Sheffield, UK
[16]School of Healthcare, University of Leicester, Leicester, UK

X Kara Gray-Burrows @KGrayBurrows, Ian Kellar @driankellar, Lucy Prodgers @lucy_prodgers, Marcin Kowalczyk @Medic_March and Jacqueline Martin-Kerry @JMartinKerry

Acknowledgements We thank the following members of the wider project team: Professor Zoe Marshman, Mr Nathaniel Mills and Dr Jess Morgan. We would

Arch Dis Child: first published as 10.1136/archdischild-2023-326044 on 14 August 2024. Downloaded from http://adc.bmj.com/ on October 2, 2024 at Sheffield Hallam Uni Consortia. Protected by copyright.

like to thank the members of our Patient and Public Involvement group for their insightful comments and contributions to the development of the recommendations within this review. We also thank Melissa Harden from the Centre for Reviews and Dissemination (CRD) at the University of York for developing and running the search strategy, and de-duplicating the records.

Contributors JM-K, RJC, VS, SE-Y, KG-B, FS, IK, PD, BP and LP developed the grant application for this piece of work. JM-K developed the scoping review protocol with input from RJC, VS, BP and SE-Y. RJC, IK, KG-B, JML, VS, MP and JM-K undertook title and abstract screening. JM-K, SE-Y, RJC, MK and JML undertook full-text screening. SB, JML, LPr, FS, LPo, AW, GW and MK undertook data extraction with checking by FS. GW, FS and JM-K undertook the stakeholder engagement activities. All coauthors provided critical input into the data extracted. RJC and JM-K drafted the manuscript and all coauthors critically reviewed this and provided input and approved the final manuscript.

Funding This scoping review was funded by the White Rose Collaboration Fund and is supported by the National Institute of Health and Care Research (NIHR) HealthTech Research Centre in Paediatrics and Child Health.

Disclaimer The views expressed in this publication are those of the authors and not necessarily those of the NIHR or the Department of Health and Social Care.

Competing interests None declared.

Patient consent for publication Not applicable.

Ethics approval Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as supplemental information.

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/.

ORCID iDs
Rosemary Jane Court http://orcid.org/0009-0001-7721-8855
Kara Gray-Burrows http://orcid.org/0000-0002-1550-5066
Ian Kellar http://orcid.org/0000-0003-1608-5216
Paul Dimitri http://orcid.org/0000-0001-7625-6713
Lucy Prodgers http://orcid.org/0000-0002-6425-7839
Jacqueline Martin-Kerry http://orcid.org/0000-0002-9299-1360

REFERENCES

1 Blower S, Swallow V, Maturana C, *et al*. Children and young people's concerns and needs relating to their use of health technology to self-manage long-term conditions: a scoping review. *Arch Dis Child* 2020;105:1093–104.
2 Khalil H, Peters M, Godfrey CM, *et al*. An evidence-based approach to scoping reviews. *Worldviews Ev Based Nurs* 2016;13:118–23.
3 Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol* 2005;8:19–32.
4 Tricco AC, Lillie E, Zarin W, *et al*. PRISMA extension for scoping reviews (PRISMA-SCR): checklist and explanation. *Ann Intern Med* 2018;169:467–73.
5 Levac D, Colquhoun H, O'Brien KK. Scoping studies: advancing the methodology. *Implement Sci* 2010;5:69.
6 Pollock D, Peters MDJ, Khalil H, *et al*. Recommendations for the extraction, analysis, and presentation of results in scoping reviews. *JBI Evid Synth* 2023;21:520–32.
7 Scoping review protocol: identifying and understanding positive elements of health technology, according to children and young people with long-term health conditions. 2021.1–8. Available: https://whiterose.ac.uk/wp-content/uploads/2022/01/CYP-HT-Scoping-review-protocol-Version-1.1-25-November-2021-1-1.pdf
8 National Institute for Health and Care Excellence, (NICE). Transition from children's to adults' services for young people using health or social care services. NICE guideline [NG43]. 2016.
9 The Office of Communications (Ofcom). The communications market report. Ofcom; 2015.
10 Elo S, Kyngäs H. The qualitative content analysis process. *J Adv Nurs* 2008;62:107–15.
11 Connan V, Marcon MA, Mahmud FH, *et al*. Online education for gluten-free diet teaching: development and usability testing of an E-learning module for children with concurrent celiac disease and type 1 diabetes. *Pediatr Diabetes* 2019;20:293–303.
12 Cliffe B, Croker A, Denne M, *et al*. Digital cognitive behavioral therapy for insomnia for adolescents with mental health problems: feasibility open trial. *JMIR Ment Health* 2020;7:e14842.
13 Chen RY, Feltes JR, Tzeng WS, *et al*. Phone-based interventions in adolescent psychiatry: a perspective and proof of concept pilot study with a focus on depression and autism. *JMIR Res Protoc* 2017;6:e114.
14 Abraham O, Wytiaz RM, Feathers AM. Paediatric use of medications and adherence apps: a qualitative analysis of the perspectives of children and parents. *Pharm Pract Res* 2019;49:123–9.
15 Alfonsi JE, Choi EEY, Arshad T, *et al*. Carbohydrate counting app using image recognition for youth with type 1 diabetes: pilot randomized control trial. *JMIR Mhealth Uhealth* 2020;8:e22074.
16 Andersen NS, Haugaard LH, Pedersen SB, *et al*. Digital support for self-management in children with diabetes: understanding their needs and developing a design concept. *Stud Health Technol Inform* 2020;270:951–5.
17 Beneitez I, Nieto R, Hernández E, *et al*. Adolescents' social needs living with juvenile idiopathic arthritis and their views about digital resources. *Adv Rheumatol* 2020;60:36.
18 Browne S, Kechadi M-T, O'Donnell S, *et al*. Mobile health apps in pediatric obesity treatment: process outcomes from a feasibility study of a multicomponent intervention. *JMIR Mhealth Uhealth* 2020;8:e16925.
19 Carey JL, Carreiro S, Chapman B, *et al*. Some and self harm: the use of social media in depressed and suicidal youth. Proceedings of the Annual Hawaii International Conference on System Sciences 2018; 2018:3314–9.
20 Carlsson I-M, Arvidsson S, Svedberg P, *et al*. Creating a communication space in the healthcare context: children's perspective of using the eHealth service. *J Child Health Care* 2021;25:31–43.
21 Choi EK, Jung E, Bae E, *et al*. Two-step integrative education program and mHealth for Korean children with Spina Bifida: a quasi-experimental pre-post study. *J Pediatr Nurs* 2020;51:e92–9.
22 Connelly MA, Boorigie ME. Feasibility of using "SMARTER" methodology for monitoring precipitating conditions of pediatric migraine episodes. *Headache* 2021;61:500–10.
23 Conte MJ, Gomes Ferreira MG, Ramírez ARG. An AAC mobile-based application for people with intellectual disability: a case study in Brazil. *Adv Hum Comput Interact* 2020;2020:1–12.
24 Cook S, Vettese E, Soman D, *et al*. Initial development of supportive care assessment, prioritization and recommendations for kids (SPARK), a symptom screening and management application. *BMC Med Inform Decis Mak* 2019;19:9.
25 Crossen S, Glaser N, Sauers-Ford H, *et al*. Home-based video visits for pediatric patients with poorly controlled type 1 diabetes. *J Telemed Telecare* 2020;26:349–55.
26 Davidson TM, Bunnell BE, Saunders BE, *et al*. Pilot evaluation of a tablet-based application to improve quality of care in child mental health treatment. *Behav Ther* 2019;50:367–79.
27 de Matos SerafimARR, Silva ANS, de Alcântara CM, *et al*. Construction of serious games for adolescents with type 1 diabetes mellitus. *Acta Paulista de Enfermagem* 2019;32:374–81.
28 Dozières-Puyravel B, Danse M, Goujon E, *et al*. Views of adolescents and their parents on mobile apps for epilepsy self-management. *Epilepsy & Behavior* 2020;106:107039.
29 Dunford C, Cobbold C, Ray I, *et al*. The information gap for children and young people with acquired brain injury. *Dev Neurorehabil* 2020;23:1–8.
30 Gao W, Yuan C, Zou Y, *et al*. Development and pilot testing a self-reported pediatric PROMIS App for young children aged 5-7 years. *J Pediatr Nurs* 2020;53:74–83.
31 Ghanouni P, Jarus T, Zwicker JG, *et al*. Design elements during development of videogame programs for children with autism spectrum disorder: stakeholders' viewpoints. *Games Health J* 2020;9:137–45.
32 Grande SW, Longacre MR, Palmblad K, *et al*. Empowering young people living with juvenile idiopathic arthritis to better communicate with families and care teams: content analysis of semistructured interviews. *JMIR Mhealth Uhealth* 2019;7:e10401.
33 Hamari L, Järvelä LS, Lähteenmäki PM, *et al*. The effect of an active video game intervention on physical activity, motor performance, and fatigue in children with cancer: a randomized controlled trial. *BMC Res Notes* 2019;12:784.
34 Iio M, Miyaji Y, Yamamoto-Hanada K, *et al*. Beneficial features of a mHealth asthma app for children and caregivers: qualitative study. *JMIR Mhealth Uhealth* 2020;8:e18506.
35 Kaushal T, Montgomery KA, Simon R, *et al*. MyDiaText TM: feasibililty and functionality of a text messaging system for youth with type 1 diabetes. *Diabetes Educ* 2019;45:253–9.

Arch Dis Child: first published as 10.1136/archdischild-2023-326044 on 14 August 2024. Downloaded from http://adc.bmj.com/ on October 2, 2024 at Sheffield Hallam Uni Consortia. Protected by copyright.

36 Khan K, Hollis C, Hall CL, *et al*. Fidelity of delivery and contextual factors influencing children's level of engagement: process evaluation of the online remote behavioral intervention for Tics trial. *J Med Internet Res* 2021;23:e25470.
37 Linder LA, Newman AR, Stegenga K, *et al*. Feasibility and acceptability of a game-based symptom-reporting app for children with cancer: perspectives of children and parents. *Support Care Cancer* 2021;29:301–10.
38 Nani S, Matsouka O, Theodorakis Y, *et al*. Perceived benefits of a therapeutic exercise program through digital interactive games among children with cancer. *Nosileftiki* 2019;58:64–70.
39 Nichols M, Teufel R, Miller S, *et al*. Managing asthma and obesity related symptoms (MATADORS): an mHealth intervention to facilitate symptom self-management among youth. *IJERPH* 2020;17:7750.
40 Nieto R, Hernández E, Boixadós M, *et al*. Testing the feasibility of DARWeb: an online intervention for children with functional abdominal pain and their parents. *Clin J Pain* 2015;31:493–503.
41 Bonadiu Pelosi M, deP, Santos Nascimento J. The use of interactive games by children with down syndrome. Br J Occup Ther / Cadernos Brasileiros de Terapia Ocupacional 2019;27:718–33.
42 Phelan I, Furness PJ, Dunn HD, *et al*. Immersive virtual reality in children with upper limb injuries: findings from a feasibility study. *J Pediatr Rehabil Med* 2021;14:401–14.
43 Powell L, Parker J, Harpin V, *et al*. Guideline development for technological interventions for children and young people to self-manage attention deficit hyperactivity disorder: realist evaluation. *J Med Internet Res* 2019;21:e12831.
44 Santana CCDAP, Freitas ATVDS, Oliveira Barreto G, *et al*. Serious game on a smartphone for adolescents undergoing Hemodialysis: development and evaluation. *JMIR Serious Games* 2020;8:e17979.
45 Sinoo C, van der Pal S, Blanson Henkemans OA, *et al*. Friendship with a robot: children's perception of similarity between a robot's physical and virtual embodiment that supports diabetes self-management. *Patient Educ Couns* 2018;101:1248–55.
46 Tark R, Metelitsa M, Akkermann K, *et al*. Usability, acceptability, feasibility, and effectiveness of a gamified mobile health intervention (Triumf) for pediatric patients: qualitative study. *JMIR Serious Games* 2019;7:e13776.
47 Terlouw G, van't Veer JTB, Kuipers DA, *et al*. Context analysis, needs assessment and persona development: towards a digital game-like intervention for high functioning children with ASD to train social skills. *Ear Child Dev Care* 2020;190:2050–65.
48 Teufel Ii RJ, Patel SK, Shuler AB, *et al*. Smartphones for real-time assessment of adherence behavior and symptom exacerbation for high-risk youth with asthma: pilot study. *JMIR Pediatr Parent* 2018;1:e8.
49 Tsimicalis A, Rennick J, Stinson J, *et al*. Usability testing of an interactive communication tool to help children express their cancer symptoms. *J Pediatr Oncol Nurs* 2018;35:320–31.
50 Vaughn J, Shah N, Docherty SL, *et al*. Symptom monitoring in children with life-threatening illness: a feasibility study using mHealth. *ANS Adv Nurs Sci* 2021;44:268–78.
51 Vaughn J, Shah N, Jonassaint J, *et al*. User-centered app design for acutely ill children and adolescents. *J Pediatr Oncol Nurs* 2020;37:359–67.
52 Whiteside SPH, Biggs BK, Tiede MS, *et al*. An online- and mobile-based application to facilitate exposure for childhood anxiety disorders. *Cogn Behav Pract* 2019;26:478–91.
53 Yildirim O, Surer E. Developing adaptive serious games for children with specific learning difficulties: a two-phase usability and technology acceptance study. *JMIR Serious Games* 2021;9:e25997.
54 Anderson LM, Leonard S, Jonassaint J, *et al*. Mobile health intervention for youth with sickle cell disease: impact on adherence, disease knowledge, and quality of life. *Pediatr Blood Cancer* 2018;65:e27081.
55 Birnie KA, Kulandaivelu Y, Jibb L, *et al*. Usability testing of an interactive virtual reality distraction intervention to reduce procedural pain in children and adolescents with cancer. *J Pediatr Oncol Nurs* 2018;35:406–16.
56 Bul KCM, Franken IHA, Van der Oord S, *et al*. Development and user satisfaction of "plan-it commander," a serious game for children with ADHD. *Games Health J* 2015;4:502–12.
57 Cai RA, Beste D, Chaplin H, *et al*. Developing and evaluating Jiapp: acceptability and usability of a Smartphone App system to improve self-management in young people with juvenile idiopathic arthritis. *JMIR Mhealth Uhealth* 2017;5:e121.
58 Chan AHY, Stewart AW, Harrison J, *et al*. Electronic adherence monitoring device performance and patient acceptability: a randomized control trial. *Expert Rev Med Devices* 2017;14:401–11.
59 Han Y, Faulkner MS, Fritz H, *et al*. A pilot randomized trial of text-Messaging for symptom awareness and diabetes knowledge in adolescents with type 1 diabetes. *J Pediatr Nurs* 2015;30:850–61.
60 Holtz BE, Murray KM, Hershey DD, *et al*. Developing a patient-centered mHealth app: a tool for adolescents with type 1 diabetes and their parents. *JMIR Mhealth Uhealth* 2017;5:e53.
61 Huby K, Swallow V, Smith T, *et al*. Children and young people's views on access to a web-based application to support personal management of long-term conditions: a qualitative study. *Child Care Health Dev* 2017;43:126–32.
62 Lam MY, Tatla SK, Lohse KR, *et al*. Perceptions of technology and its use for therapeutic application for individuals with hemiparesis: findings from adult and pediatric focus groups. *JMIR Rehabil Assist Technol* 2015;2:e1.
63 Moola F. The complexities of contagion: the experience of social isolation among children and youth living with cystic fibrosis in Canada. *J Child Health Care* 2018;22:631–45.
64 Morrow AM, Burton KLO, Watanabe MM, *et al*. Developing brighthearts: a pediatric biofeedback-mediated relaxation App to manage procedural pain and anxiety. *Pain Pract* 2018;18:698–708.
65 Morton RW, Elphick HE, Edwards E, *et al*. Investigating the feasibility of text message reminders to improve adherence to Nebulized medication in children and adolescents with cystic fibrosis. *Patient Prefer Adherence* 2017;11:861–9.
66 Nightingale R, Hall A, Gelder C, *et al*. Desirable components for a customized, home-based, Digital care-management app for children and young people with long-term, chronic conditions: a qualitative exploration. *J Med Internet Res* 2017;19:e235.
67 Ruggiero KJ, Bunnell BE, Andrews Iii AR, *et al*. Development and pilot evaluation of a tablet-based application to improve quality of care in child mental health treatment. *JMIR Res Protoc* 2015;4:e143.
68 Sparapani V de C, Fels S, Nascimento LC. The value of children's voices for a video game development in the context of type 1 diabetes: focus group study. *JMIR Diabetes* 2017;2:e17.
69 Thabrew H, Stasiak K, Garcia-Hoyos V, *et al*. Game for health: how eHealth approaches might address the psychological needs of children and young people with long-term physical conditions. *J Paediatr Child Health* 2016;52:1012–8.
70 Tsimicalis A, Le May S, Stinson J, *et al*. Linguistic validation of an interactive communication tool to help French-speaking children express their cancer symptoms. *J Pediatr Oncol Nurs* 2017;34:98–105.
71 Waite-Jones JM, Swallow V. Peer-based social support for young-people with juvenile arthritis: views of young people, parents/carers and healthcare professionals within the UK. *J Pediatr Nurs* 2018;43:e85–91.
72 Waite-Jones JM, Majeed-Ariss R, Smith J, *et al*. Young people's, parents', and professionals' views on required components of mobile apps to support self-management of juvenile arthritis: qualitative study. *JMIR Mhealth Uhealth* 2018;6:e25.
73 Wang J, Yao NA, Liu Y, *et al*. Development of a smartphone application to monitor pediatric patient-reported outcomes. *Stud Health Technol Inform* 2017;245:253–7.
74 White SW, Abbott L, Wieckowski AT, *et al*. Feasibility of automated training for facial emotion expression and recognition in autism. *Behavior Therapy* 2018;49:881–8.
75 Caltenco H, Magnusson C, Rydeman B, *et al*. Co-designing wearable technology together with visually impaired children. *Int J Mob Hum Comput Interact* 2016;8:68–84.
76 Clark A, Deverell D, Corcoran E, *et al*. Finger prick to finger tip: use of mobile phone technology to send PKU blood results. *J Nutr Metab* 2018;2018:2178346.
77 Raval MV, Taylor N, Piper K, *et al*. Pediatric patient and caregiver preferences in the development of a mobile health application for management of surgical colorectal conditions. *J Med Syst* 2017;41:105.
78 Strauss P, Morgan H, Wright Toussaint D, *et al*. Trans and gender diverse young people's attitudes towards game-based Digital mental health interventions: a qualitative investigation. *Internet Interv* 2019;18:100280.
79 O'Bree B, Walton CC, Bendall S, *et al*. Perceived helpfulness of a moderated online social therapy network for young people experiencing social anxiety. *IJERPH* 2021;18:2796.
80 Devine KA, Viola AS, Coups EJ, *et al*. Digital health interventions for adolescent and young adult cancer survivors. *JCO Clin Cancer Inform* 2018;2:1–15.
81 Boggiss AL, Consedine NS, Schache KR, *et al*. Exploring the views of adolescents with type 1 diabetes on digital mental health interventions: what functionality and content do they want? *Diabet Med* 2021;38:e14591.
82 Brigden A, Barnett J, Parslow RM, *et al*. Using the internet to cope with chronic fatigue syndrome/myalgic encephalomyelitis in adolescence: a qualitative study. *Bmjpo* 2018;2:e000299.
83 Chapman R, Loades M, O'Reilly G, *et al*. 'Pesky gNATs': investigating the feasibility of a novel computerized CBT intervention for adolescents with anxiety and/or depression in a tier 3 CAMHS setting. *tCBT* 2016;9.
84 Domínguez M, Sapiña L. An approach to the use of the Internet and social networks in adolescents and young adults diagnosed with cancer. *J Canc Educ* 2017;32:885–91.
85 Holmberg C, Berg C, Dahlgren J, *et al*. Health literacy in a complex digital media landscape: pediatric obesity patients' experiences with online weight, food, and health information. *Health Informatics J* 2019;25:1343–57.
86 Klaassen R, Bul KCM, Op den Akker R, *et al*. Design and evaluation of a pervasive coaching and gamification platform for young diabetes patients. *Sensors (Basel)* 2018;18:402.
87 Knoblock-Hahn AL, Wray R, LeRouge CM. Perceptions of adolescents with overweight and obesity for the development of user-centered design self-management tools within the context of the chronic care model: a qualitative study. *J Acad Nutr Diet* 2016;116:957–67.
88 Koster ES, Philbert D, de Vries TW, *et al*. 'I just forget to take it': asthma self-management needs and preferences in adolescents. *J Asthma* 2015;52:831–7.

Arch Dis Child: first published as 10.1136/archdischild-2023-326044 on 14 August 2024. Downloaded from http://adc.bmj.com/ on October 2, 2024 at Sheffield Hallam Uni Consortia. Protected by copyright.

89 Mendoza JA, Baker KS, Moreno MA, *et al*. A Fitbit and Facebook mHealth intervention for promoting physical activity among adolescent and young adult childhood cancer survivors: a pilot study. *Pediatr Blood Cancer* 2017;64.
90 Ramsey RR, Carmody JK, Holbein CE, *et al*. Examination of the uses, needs, and preferences for health technology use in adolescents with asthma. *J Asthma* 2019;56:964–72.
91 Schoenfelder E, Moreno M, Wilner M, *et al*. Piloting a mobile health intervention to increase physical activity for adolescents with ADHD. *Prev Med Rep* 2017;6:210–3.
92 Singleton A, Abeles P, Smith IC. Online social networking and psychological experiences: the perceptions of young people with mental health difficulties. *Comput Hum Behav* 2016;61:394–403.
93 Yi-Frazier JP, Cochrane K, Mitrovich C, *et al*. Using Instagram as a modified application of Photovoice for storytelling and sharing in adolescents with type 1 diabetes. *Qual Health Res* 2015;25:1372–82.
94 Aschbrenner KA, Naslund JA, Tomlinson EF, *et al*. Adolescents' use of digital technologies and preferences for mobile health coaching in public mental health settings. *Front Public Health* 2019;7:178.
95 Bevan Jones R, Thapar A, Rice F, *et al*. A digital intervention for adolescent depression (MoodHwb): mixed methods feasibility evaluation. *JMIR Ment Health* 2020;7:e14536.
96 Fedele DA, Cushing CC, Koskela-Staples N, *et al*. Adaptive mobile health intervention for adolescents with asthma: iterative user-centered development. *JMIR Mhealth Uhealth* 2020;8:e18400.
97 Knibbe TJ, McPherson AC, Gladstone B, *et al*. 'It's all about incentive': social technology as a potential facilitator for self-determined physical activity participation for young people with physical disabilities. *Dev Neurorehabil* 2018;21:521–30.
98 Beaudry J, Consigli A, Clark C, *et al*. Getting ready for adult healthcare: designing a Chatbot to coach adolescents with special health needs through the transitions of care. *J Pediatr Nurs* 2019;49:85–91.
99 Francis J, Cross D, Schultz A, *et al*. Developing a smartphone application to support social connectedness and wellbeing in young people with cystic fibrosis. *J Cyst Fibros* 2020;19:277–83.
100 Stinson J, Gupta A, Dupuis F, *et al*. Usability testing of an online self-management program for adolescents with cancer. *J Pediatr Oncol Nurs* 2015;32:70–82.
101 Davis SR, Peters D, Calvo RA, *et al*. A consumer designed smartphone app for young people with asthma: pilot of engagement and acceptability. *J Asthma* 2021;58:253–61.
102 Garrido S, Cheers D, Boydell K, *et al*. Young people's response to six smartphone apps for anxiety and depression: focus group study. *JMIR Ment Health* 2019;6:e14385.
103 Ledderer L, Møller A, Fage-Butler A. Adolescents' participation in their healthcare: a sociomaterial investigation of a diabetes app. *Digital Health* 2019;5:205520761984544.
104 Husted GR, Weis J, Teilmann G, *et al*. Exploring the influence of a smartphone app (young with diabetes) on young people's self-management: qualitative study. *JMIR Mhealth Uhealth* 2018;6:e43.
105 Badawy SM, Thompson AA, Liem RI. Technology access and smartphone app preferences for medication adherence in adolescents and young adults with sickle cell disease. *Pediatr Blood Cancer* 2016;63:848–52.
106 Roberts C, Sage A, Geryk L, *et al*. Adolescent preferences and design recommendations for an asthma self-management app: mixed-methods study. *JMIR Formativ Res* 2018;2:e10055.
107 Shellmer DA, Dew MA, Mazariegos G, *et al*. Development and field testing of teen pocket PATH(), a mobile health application to improve medication adherence in adolescent solid organ recipients. *Pediatric Transplantation* 2016;20:130–40.
108 Sezgin E, Weiler M, Weiler A, *et al*. Proposing an ecosystem of digital health solutions for teens with chronic conditions transitioning to self-management and independence: exploratory qualitative study. *J Med Internet Res* 2018;20:e10285.
109 Wysocki T, Hirschfeld F, Miller L, *et al*. Consideration of insulin pumps or continuous glucose monitors by adolescents with type 1 diabetes and their parents: stakeholder engagement in the design of web-based decision AIDS. *Diabetes Educ* 2016;42:395–407.
110 Howard S, Lang A, Sharples S, *et al*. See I told you I was taking it! - attitudes of adolescents with asthma towards a device monitoring their Inhaler use: implications for future design. *Appl Ergon* 2017;58:224–37.
111 LeRouge CM, Hah H, Deckard GJ, *et al*. Designing for the co-use of consumer health technology in self-management of adolescent overweight and obesity: mixed methods qualitative study. *JMIR Mhealth Uhealth* 2020;8:e18391.
112 Ammerlaan JJ, Scholtus LW, Drossaert CH, *et al*. Feasibility of a website and a hospital-based online portal for young adults with juvenile idiopathic arthritis: views and experiences of patients. *JMIR Res Protoc* 2015;4:e102.
113 Williamson H, Griffiths C, Harcourt D. Developing young person's face IT: online psychosocial support for adolescents struggling with conditions or injuries affecting their appearance. *Health Psychology Open* 2015;2:205510291561909.
114 Grasaas E, Fegran L, Helseth S, *et al*. iCanCope with pain: cultural adaptation and usability testing of a self-management App for adolescents with persistent pain in Norway. *JMIR Res Protoc* 2019;8:e12940.
115 Davis SA, Coyne I, Carpenter DM, *et al*. Adolescent preferences regarding a web site to empower adolescents to talk with their Healthcare providers. *J Adolesc Health* 2021;68:629–31.
116 Cooke M, Richards J, Tjondronegoro D, *et al*. myPainPal: co-creation of a mHealth app for the management of chronic pain in young people. *Inform Health Soc Care* 2021;46:291–305.
117 Breakey VR, Bouskill V, Nguyen C, *et al*. Online peer-to-peer mentoring support for youth with Hemophilia: qualitative needs assessment. *JMIR Pediatr Parent* 2018;1:e10958.
118 van Rensburg SH, Klingensmith K, McLaughlin P, *et al*. Patient-provider communication over social media: perspectives of adolescents with psychiatric illness. *Health Expect* 2016;19:112–20.
119 Douma M, Joosten MMH, Scholten L, *et al*. Online cognitive-behavioral group intervention for adolescents with chronic illness: a pilot study. *Clin Pract Pediatr Psychol* 2019;7:79–92.
120 Caron JG, Light J. Social media experiences of adolescents and young adults with cerebral palsy who use augmentative and alternative communication. *Int J Speech Lang Pathol* 2017;19:30–42.
121 Davis SR, Peters D, Calvo RA, *et al*. 'Kiss myAsthma': using a participatory design approach to develop a self-management app with young people with asthma. *J Asthma* 2018;55:1018–27.
122 Jones CJ, Sommereux LA, Smith HE. Exploring what motivates and sustains support group engagement amongst young people with allergies: a qualitative study. *Clin Exp Allergy* 2018;48:1195–205.
123 Kelly SL, Steinberg EA, Suplee A, *et al*. Implementing a home-based telehealth group adherence intervention with adolescent transplant recipients. *Telemed J E Health* 2019;25:1040–8.
124 Roberts CA, Geryk LL, Sage AJ, *et al*. Adolescent, caregiver, and friend preferences for integrating social support and communication features into an asthma self-management app. *J Asthma* 2016;53:948–54.
125 Santesteban-Echarri O, Rice S, Wadley G, *et al*. A next-generation social media-based relapse prevention intervention for youth depression: qualitative data on user experience outcomes for social networking, safety, and clinical benefit. *Internet Interv* 2017;9:65–73.
126 Bradford S, Rickwood D. Young people's views on electronic mental health assessment: prefer to type than talk? *J Child Fam Stud* 2015;24:1213–21.
127 Gibson K, Cartwright C, Kerrisk K, *et al*. What young people want: a qualitative study of adolescents' priorities for engagement across psychological services. *J Child Fam Stud* 2016;25:1057–65.
128 Radovic A, DeMand AL, Gmelin T, *et al*. SOVA: design of a stakeholder informed social media website for depressed adolescents and their parents. *J Technol Hum Serv* 2018;35:169–82.
129 Clark LH, Hudson JL, Dunstan DA, *et al*. Capturing the attitudes of adolescent males' towards computerised mental health help-seeking. *Australian Psychologist* 2018;53:416–26.
130 Carpenter DM, Geryk LL, Sage A, *et al*. Exploring the theoretical pathways through which asthma app features can promote adolescent self-management. *Transl Behav Med* 2016;6:509–18.
131 Falconer CJ, Davies EB, Grist R, *et al*. Innovations in practice: AVATAR-based virtual reality in CAMHS talking therapy: two exploratory case studies. *Child Adoles Ment Health* 2019;24:283–7.
132 Roberts CA, Sage AJ, Geryk LL, *et al*. Adolescent feedback on predisposing, reinforcing and enabling features in asthma self-management apps. *Health Education Journal* 2019;78:770–83.
133 Newton A, Bagnell A, Rosychuk R, *et al*. A mobile phone-based app for use during cognitive behavioral therapy for adolescents with anxiety (MindClimb): user-centered design and usability study. *JMIR Mhealth Uhealth* 2020;8:e18439.
134 Bergner EM, Whittemore R, Patel NJ, *et al*. Participants' experience and engagement in check it!: a positive psychology intervention for adolescents with type 1 diabetes. *Transl Issues Psychol Sci* 2018;4:215–27.
135 Cushing A, Manice MP, Ting A, *et al*. Feasibility of a novel mHealth management system to capture and improve medication adherence among adolescents with asthma. *Patient Prefer Adherence* 2016;10:2271–5.
136 Jensen CD, Duncombe KM, Lott MA, *et al*. An evaluation of a smartphone-assisted behavioral weight control intervention for adolescents: pilot study. *JMIR Mhealth Uhealth* 2016;4:e102.
137 Jibb LA, Cafazzo JA, Nathan PC, *et al*. Development of a mHealth real-time pain self-management app for adolescents with cancer: an Iterative usability testing study. *J Pediatr Oncol Nurs* 2017;34:283–94.
138 Perry TT, Marshall A, Berlinski A, *et al*. Smartphone-based vs paper-based asthma action plans for adolescents. *Ann Allergy Asthma Immunol* 2017;118:298–303.
139 Sage A, Roberts C, Geryk L, *et al*. A self-regulation theory-based asthma management mobile app for adolescents: a usability assessment. *JMIR Hum Factors* 2017;4:e5.
140 Schneider T, Panzera AD, Couluris M, *et al*. Engaging teens with asthma in designing a patient-centered mobile app to aid disease self-management. *Telemed J E Health* 2016;22:170–5.

Arch Dis Child: first published as 10.1136/archdischild-2023-326044 on 14 August 2024. Downloaded from http://adc.bmj.com/ on October 2, 2024 at Sheffield Hallam Uni Consortia. Protected by copyright.

141 LeRouge C, Dickhut K, Lisetti C, *et al*. Engaging adolescents in a computer-based weight management program: avatars and virtual coaches could help. *J Am Med Inform Assoc* 2016;23:19–28.
142 Belsky JA, Holmes C, Stanek J, *et al*. Evaluating perspectives of a Smartphone medication application in the adolescent and young adult oncology population: a qualitative study. *J Adolesc Young Adult Oncol* 2021;10:282–7.
143 Whiteley L, Brown L, Lally M, *et al*. A mobile gaming intervention to increase adherence to antiretroviral treatment for youth living with HIV: development guided by the information, motivation, and behavioral skills model. *JMIR Mhealth Uhealth* 2018;6:e96.
144 Lai B, Davis D, Narasaki-Jara M, *et al*. Feasibility of a commercially available virtual reality system to achieve exercise guidelines in youth with Spina Bifida. *JMIR Serious Games* 2020;8:e20667.
145 Roddis JK, Holloway I, Bond C, *et al*. Living with a long-term condition: understanding well-being for individuals with thrombophilia or asthma. *Int J Qual Stud Health Well-Being* 2016;11:31530–10.

Arch Dis Child: first published as 10.1136/archdischild-2023-326044 on 14 August 2024. Downloaded from http://adc.bmj.com/ on October 2, 2024 at Sheffield Hallam Uni Consortia. Protected by copyright.