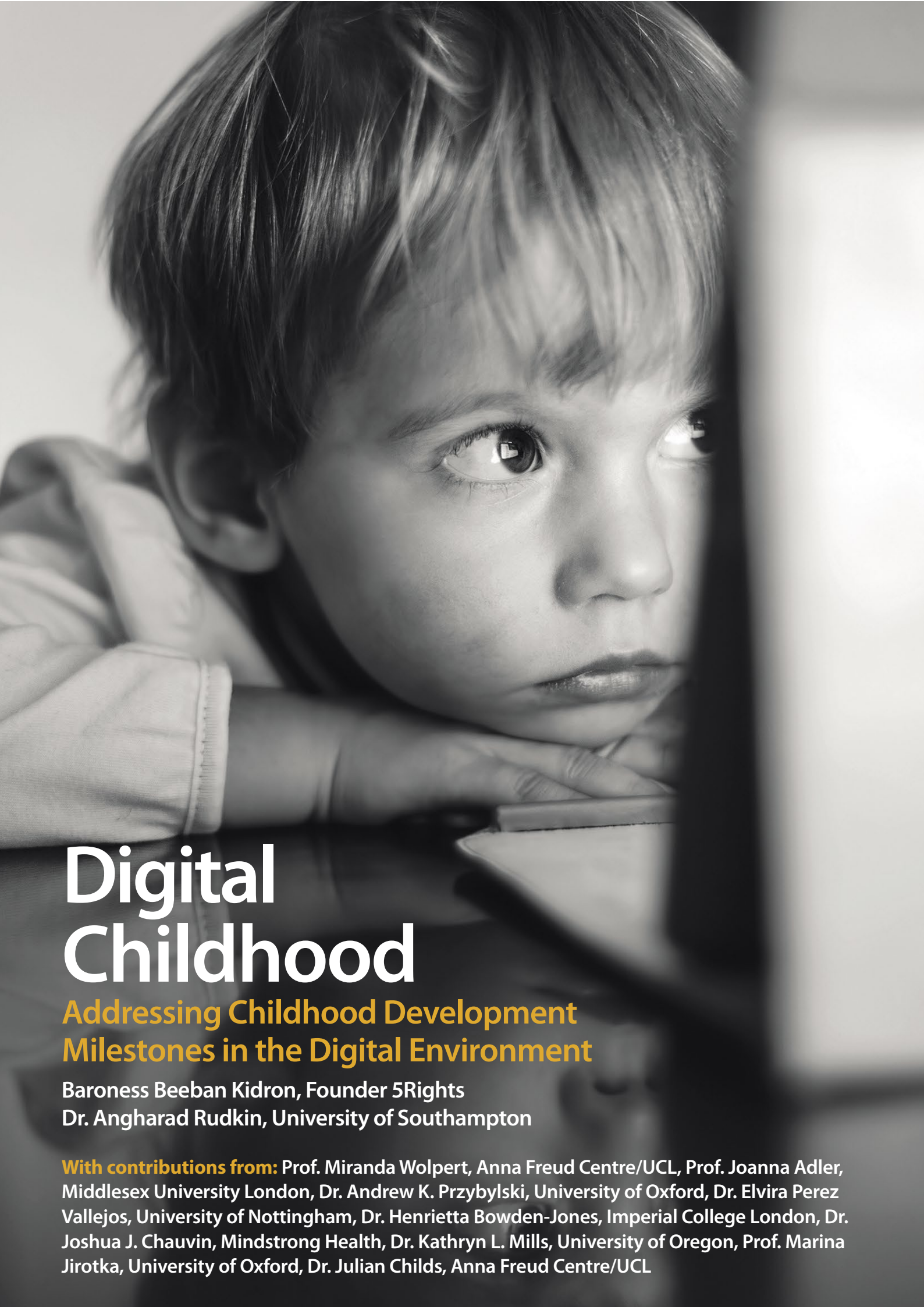

Digital Childhood

Addressing Childhood Development Milestones in the Digital Environment

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Introduction

This Digital Childhood paper considers how growing up in the digital environment directly impacts on a child's development trajectory. It concludes that a managed route from infancy to adulthood is as important in the digital environment as it is in the analogue world.

The digital environment was conceived as an environment for adult users. Not even its inventors thought it might one day be a place where childhood would be spent. Nor did they make any design concessions for child users. On the contrary, the utopian vision was that all users would be equal. And if all users are equal, then a child user is treated as if they were an adult.

This urgently needed report describes the narrative of children and the digital environment. It defines their needs as a series of opportunities and requirements that align with their age and meet their development goals, rather than the current emphasis on a narrow set of adult-identified harms.

For many readers this will be the first time that they have considered how the design and purposes of the digital world impacts on children and young people's ability to meet their childhood development milestones. The report takes each age group in turn, sets out what we know about child development, the major digital interactions of children at that age, and then considers the risks and opportunities.

Where there is existing evidence, it is cited and where the authors have extrapolated from their professional practice, it is indicated. In order to gather the range of expertise necessary it was imperative to consult across a large number of professional disciplines.

The conclusion across all disciplines was unanimous. We need to recalibrate how we treat children in the digital environment.

Baroness Beeban Kidron

Dr. Angharad Rudkin

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Executive summary

It is clear that the world of digital is here to stay. Moreover, it is a welcome and necessary component of a 21st century childhood.

Children's wellbeing in the digital environment is of no less importance than their wellbeing in any other setting.

The digital environment is a 'man- and woman-made' technology and can therefore be designed according to the needs of children and young people to meet their developmental milestones. So far, however, it has failed to adapt to children's needs.

Children are often the early adopters of emerging services and technologies and therefore the first to spot its contradictions and challenges, yet they are rarely asked their opinion, and are very often the last to be heard.

The digital environment looks quite different when we look at it from the point of view of a child's ability to meet his or her development goals. Rather than a single environment, it appears as a landscape of opportunity, understanding, risk and misunderstanding, which is unusually absent of parental advice and regulatory protections.

There is a cavalier attitude towards the needs of young people in the digital environment on their developmental journey. While we focus on, but often fail, to keep children safe, there is little regard for concepts of childhood and graduated maturity, or for the long established societal norms that safeguard the rights and privileges of children.

The digital environment was not intended as a place for childhood, yet more than a third of its nearly 3 billion users are under 18.

This paper contains 36 recommendations, but they can be characterised by the following observations:

> A child's need to meet his or her developmental milestones is paramount and must inform research, policy and practice in the digital environment.

> Digital habits start young and impact the journey to adulthood.

> We cannot solely rely on the digital resilience of children. Industry and government must adapt the digital environment to make it fit for children by acting above and beyond commercial consideration.

Every child has the right to access the digital world creatively, knowledgeably and fearlessly. Without access they are disadvantaged. But access that is predicated on adult maturity provides a complex environment that often gets in the way of young people meeting their development goals.

The authors of this report call on all parties to make a digital environment 'fit for childhood'.

Using childhood development milestones to inform policy

Research from the last few decades has documented the universal changes that occur during childhood, from walking and talking to beginning to understand the world in an adult way. Research on child development has been used to inform education, policy and parenting practices for at least a generation.

For example, recent research has indicated that a young person's brain continues to develop into their mid-twenties. This has led to a move towards continued education for young people throughout their early twenties.

The majority of child development research predates the digital age. With digital development occurring at a quicker pace than research, it is difficult to get an accurate picture of the impact. Digital technology is only 25 years old, and has only been ubiquitously in the hands of children over the last five years.

More than any other development, its features of portability, personalisation, profiling and speed of amplification mean that a child can live on a public stage with a great deal of autonomy from a young age.

More longitudinal and detailed cross-sectional research is urgently required so that children can maintain their wellbeing in a digital world and can build up individual autonomy as empowered digital citizens ('digital agency')[1].

Current research needs to broaden from an agenda of adult-identified harms to one that captures all the experiences and anxieties that children and young people face. They are early adopters of technology and their voices should be at the forefront of research.

This research must identify the needs of vulnerable children, and the age-determined vulnerabilities of all children, and how they are influenced in a digital context.

Illustrative scenario

A child of 10 may be able to negotiate a game's intuitive settings but will not yet have the capacity to understand why other users in a game use adult language or have the freedom to stay online and build on their lucky streak.

Mirroring behaviour is a completely normal learning tool of growing up, from a baby mirroring a smiling adult to a 10-year-old mimicking the language they hear playing World of Warcraft. However, if the context is unclear and the rules are adult, then a child can easily find that the content, time spent and the relationships initiated risk being age-inappropriate.

Traditional discourse looks only at harms but in that example many aspects play a part:

***What is the context?** Social, public, private? Is it commercial? Is there advertising? Are there in-game payments? Is the game regulated?*

***Who are the participants?** Adults, children, friends, strangers? Are they anonymous, traceable, many or few?*

***What is the content?** Virtual reality, reality, cartoon? Is it explicit, violent, misogynistic? Commercial, creative, user-generated, editorially judged?*

***When and for how long?** Is the game littered with compulsive reward loops or offered with time limits? Is the time of day and implications of playing with people in a different time zone obvious?*

There may be nothing in the content of this particular game that offers a problem or danger for this particular child.

However, the average 10-year-old, who needs 10 hours of sleep, may not have the money for an in-game payment at the crucial moment or may be 'primed' by the seductive technology to 'play on' when it is time for dinner/bed/homework.

Even with the most innocuous of in-game content, they may not have the awareness or ability to set appropriate privacy settings and ad blockers, and may be inundated with unregulated and unsuitable adverts and offers from people or services.

When added up, this rather innocuous scenario, played out daily across the world in millions of children's bedrooms, requires a series of critical assessments and multiple acts of maturity in order that a 10-year-old can make good decisions. This would be hugely challenging for a child of 6 years old but much less so for a young person of 17 years.

Not only are children not adults, but children of different ages have vast differences in maturity, understanding and capacity. Yet with a few exceptions of 'walled garden' services for very young children, these chronological differences are rarely reflected in the services of the digital world.

Some technological norms present specific problems for children at different points in their development, including 'reward loops' and 'priming', the rapid spread of personal information, commercial gathering of personal data, information filters, unmarked commercial activity and profiling.

For children and young people to have a healthy and informed relationship with technology, it is necessary that the design norms of technology, the education curriculum and regulatory or legislative frameworks always consider the age of the user. These needs must be understood to be a complex set of risks, confusions and opportunities, rather than the simplistic view that underpins our current harms agenda.

The context in which a child accesses the digital environment can be as important as the content, and the kind of activity as important as the time spent. The nature of the interaction is as important as the purpose. These issues have not, as yet, been given sufficient weight in research, policy or public debate.

Using technology cannot, in itself, be taken as evidence that the individual child is a creative participant in the digital environment with full digital literacy, agency and citizenship.

Recommendations:

1. **Government should use childhood development milestones to determine its policy-making process.** It must recognise that technology is not a neutral force and advocate on behalf of children. It must look beyond the narrow 'harms' agenda and align policy interventions to the needs of childhood development milestones across all departments.

2. **Industry should use its creativity and innovation to put the wellbeing of children into the fabric of their offerings.** It must consider the age of users in all development, coding, design and communications. This should include easy options for children to switch off or opt out of features that 'prime' or deliberately extend use.

3. **Industry should commit to delivering age-appropriate digital agency to children, even when it challenges their own commercial interests.** Minimum standards (recommendation 6) should be mandatory throughout the value chain. Child-friendly code should not be patented, but open source, so that 'start ups' and smaller players can easily adopt it.

4. **Government should collate existing research and fund new research to create an informed and comprehensive picture of digital childhood.** That research should:
   - Consider the nature, purpose and beneficiary of children's digital interactions
   - Take account of the specific needs of vulnerable children
   - Consider the developmental implications of living digitally from infancy within the following developmental age groups: infancy, 3-5, 6-9, 10-12, 13-15, 16-18 and 18+ years
   - Ensure that data from government regulators and departments (e.g. Ofcom, ICO, DoE) is collected for each of these age groupings

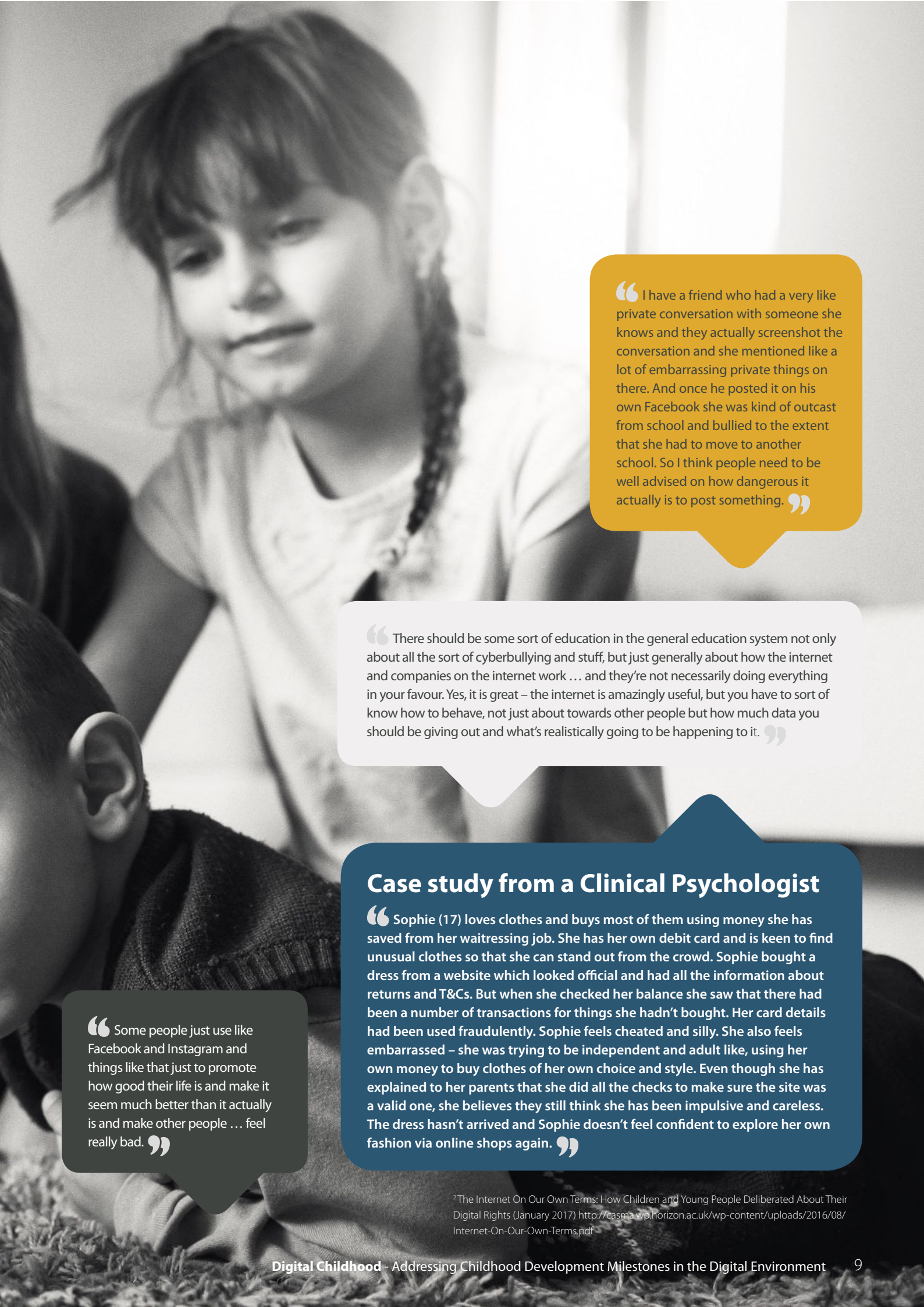
5. **Government must make certain that children's attitudes and solutions are meaningfully captured, and are part of the policy-making process**. In order to facilitate research with children, clear guidance must be provided to undertake a gold standard, child-centric research practice that complies with, but is not hampered by, child welfare and data protection legislation.

[1] Digital agency = children making choices based on information that they can understand in conditions that allow for meaningful choice.

The voices of children and young people…[2]

"That's been happening to me recently because I … I went on [brand website] like two days ago and now every site I go on it just comes up with [brand name] and it just keeps showing all these shoes going round and round. I'm just like, I've seen what I need to see. Just leave me alone now. And it's like, I'm trying to … do research for my GCSEs and stuff and it's just got all these shoes, like, just going round. It's such a distraction."

"I've almost … actually I have missed an exam because of that … You can't restrict yourself from self-indulging. So, like, you know … you're getting messages and that and you can't stop yourself from looking at your phone and getting on your laptop and stuff like that. And it slows you down as a person and it affects you. So, because of that I've missed an exam and I can't like wake up next morning because I'm awake speaking to someone at four in the morning or something. Because someone hash-tagged something on Twitter or something. It happens all the time."



> I have a friend who had a very like private conversation with someone she knows and they actually screenshot the conversation and she mentioned like a lot of embarrassing private things on there. And once he posted it on his own Facebook she was kind of outcast from school and bullied to the extent that she had to move to another school. So I think people need to be well advised on how dangerous it actually is to post something.

> There should be some sort of education in the general education system not only about all the sort of cyberbullying and stuff, but just generally about how the internet and companies on the internet work … and they're not necessarily doing everything in your favour. Yes, it is great – the internet is amazingly useful, but you have to sort of know how to behave, not just about towards other people but how much data you should be giving out and what's realistically going to be happening to it.

> Some people just use like Facebook and Instagram and things like that just to promote how good their life is and make it seem much better than it actually is and make other people … feel really bad.

Case study from a Clinical Psychologist

Sophie (17) loves clothes and buys most of them using money she has saved from her waitressing job. She has her own debit card and is keen to find unusual clothes so that she can stand out from the crowd. Sophie bought a dress from a website which looked official and had all the information about returns and T&Cs. But when she checked her balance she saw that there had been a number of transactions for things she hadn't bought. Her card details had been used fraudulently. Sophie feels cheated and silly. She also feels embarrassed – she was trying to be independent and adult like, using her own money to buy clothes of her own choice and style. Even though she has explained to her parents that she did all the checks to make sure the site was a valid one, she believes they still think she has been impulsive and careless. The dress hasn't arrived and Sophie doesn't feel confident to explore her own fashion via online shops again.

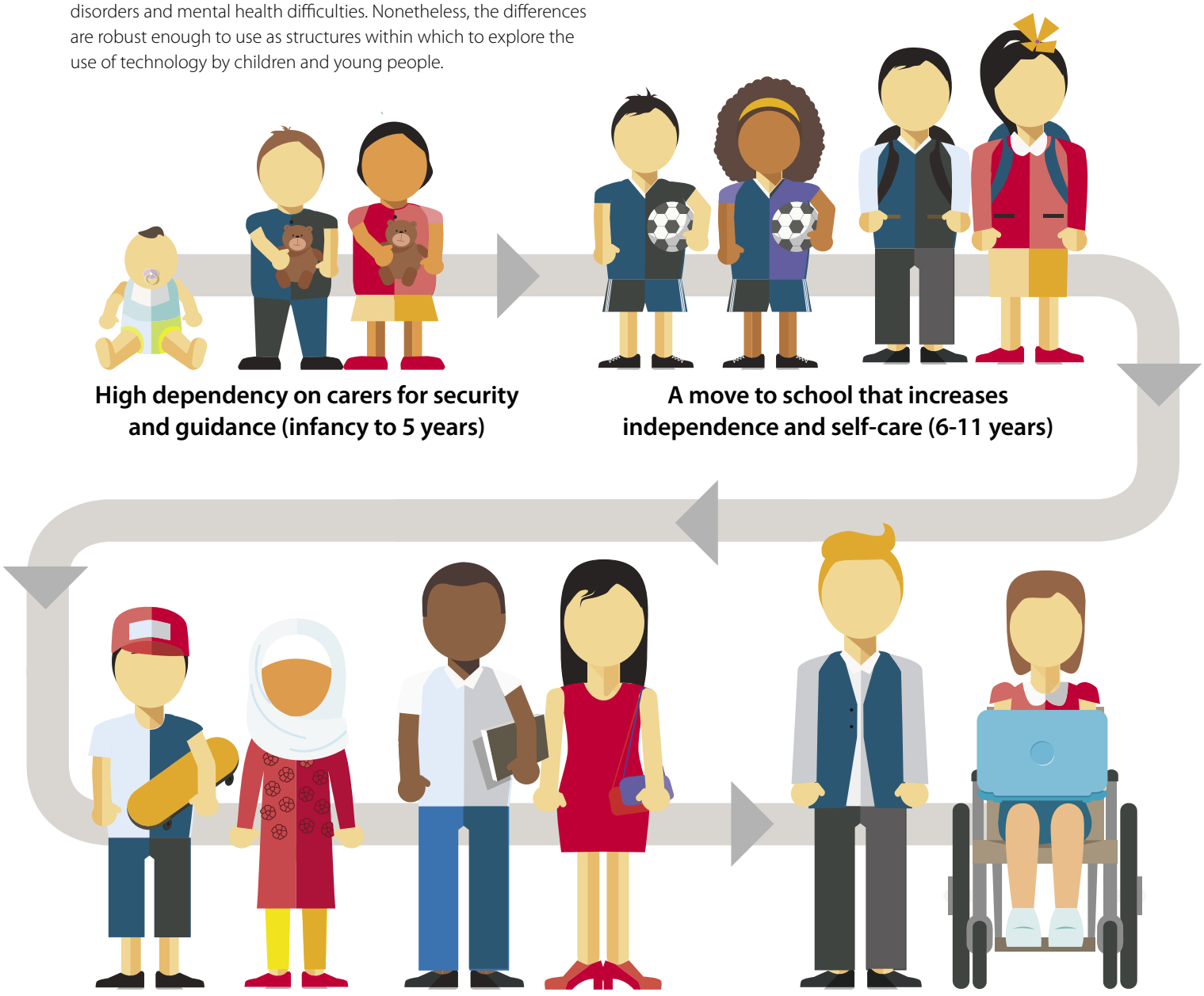
[2] The Internet On Our Own Terms: How Children and Young People Deliberated About Their Digital Rights (January 2017) http://casma.wp.horizon.ac.uk/wp-content/uploads/2016/08/Internet-On-Our-Own-Terms.pdf

Designing with childhood milestones in mind

Both industry and government have focused on the harms children face in the digital environment. Many of these harms, however, are simply the 'outcomes' of children's use of a technology designed for adult users; it therefore follows that they can only be tackled by industry and government anticipating and designing with the needs of a child user in mind.

Child development research highlights key differences between broad age groups. There will be inevitable exceptions to these differences, particularly when taking into account developmental disorders and mental health difficulties. Nonetheless, the differences are robust enough to use as structures within which to explore the use of technology by children and young people.

In broad terms, childhood development moves from a state of high dependency on carers for security and guidance (infancy to 5 years), towards a move to school that increases independence and self-care (6-11 years), through to adolescence which is a time of increasing autonomy and growing reliance on peers for approval and support (12-18 years) and the final step in the move towards fully independent adult living (18-25). [Post-18 is outside the scope of this report.]



High dependency on carers for security and guidance (infancy to 5 years)

A move to school that increases independence and self-care (6-11 years)

Adolescence, a time of increasing autonomy and growing reliance on peers for approval and support (12-18 years)

Final step in the move towards fully independent adult living (18-25)

Loving the 'likes'

The interaction between digital use and development stages is set out in greater detail in the next chapter. One of the challenges faced by designers is that young people need to use technology to 'rehearse' their social interactions in preparation for adolescence, but the technology that they use is designed to share data with large numbers of people and threatens exposure to mass social judgement.

This is all in the context of an unforgiving technological system that does not easily provide for forgetting and moving on.

In responding to an invite, posting a picture or 'liking' an Instagram post, a young person may be doing his or her 'developmental best' by trying out a new social interaction. But in the digital world these interactions are often not done within familial or social groups where the child is known and loved. Instead, they are sent into the ether, often with an 'unknown' audience, out of sight of adult care.

Undoubtedly it can be exciting. Indeed, it is designed to be exciting as the 'likes' pour in as a form of social affirmation, including from those the young person is pleased to hear from. However, it can also be devastating if the young person misjudges the tone, content or the timing.

Normally it is neither of the two extremes. A more common scenario is that there are just a few responses, leading to disappointment, or a few too many, leading to a bit of anxiety about overexposure.

From a child development perspective this is what is of most interest. Almost all digital interactions, social media particularly, are deliberately designed to make an individual want to undertake the cycle again, immediately and repeatedly[3], whatever the time of day or night[4]. And it is this cycle; always being on, always performing, always looking for affirmation from a digital audience, both exciting and anxiety provoking, that is a challenge to a child of 9, 11 or 13.

Because at the very time they should be rehearsing and retreating back to 'trusted circles' of family, classmates, teachers or interest groups to define themselves, they are waiting for the tide of Instagram messages to confirm how they compare to an increasingly exaggerated set of social norms. The attention economy is based on the greatest rewards of attention being given to the loudest, sexiest, most opinionated, outrageous, bravest or tragic.

The need for attention is problematic for children who do not yet know how to judge the veracity of what they are attending to, and who are vulnerable to making long-term decisions for themselves about their digital identity without understanding the commercial purposes of the digital environments they are inhabiting, and without having sufficient access to the creative and participatory elements of the technology they are using. Testing the limits of sexuality or popularity is not new, but the environment in which things are shared, copied, commented on and amplified exponentially, is.

Think about the most embarrassing event of your childhood and imagine it as an item on the 10 o'clock news. That is the lived reality of most children and young people every day.

Existing research shows that young people want a more managed environment[5]. Far from being the most competent users of technology, children remain firmly on the lowest rung of the digital opportunity ladder[6] as they spend the greatest periods of time in the fewest number of places.

Recommendations:

6. Government should set out 'minimum standards of age-appropriate design' backed by regulatory powers, where the end user could be a child. Regulation must be underpinned by the principle that children need comprehensive access to the digital environment on terms that they understand. Technology must be designed to promote their wellbeing and give digital agency. These standards will provide a new norm for children and will consider:

- The nature, purpose and beneficiary of children's digital interactions
- How they impact on childhood development goals
- Evidence-based risks and harms
- Clear labelling of different types of digital spaces including: creative, play, entertainment, education, social and commercial

7. Industry should consider every interaction of a child with the digital environment as an opportunity to support creativity and participation. They should be working to social and technical standards informed by childhood development milestones. This means:

- Designing technology that allows children to break reward loops
- Offering data collection policies appropriate to under 18s
- Upholding their own published community standards
- Offering timely support and resolution services that children can easily access
- Clear signposting to 'trusted' sources of information
- Transparency about the way in which technologies impact on individual behaviours
- Standards for information breach liability and security, particularly for Internet of Things toys and devices

8. In creating industry standards, those responsible for government policy, including ministers and civil servants, should take account of children's rights (UNCRC, EU and UK) in the digital environment. It must put children's rights above commercial considerations in all cases including, but not limited to, policy, guidance, education and training.

9. Where technologies are age-rated, these ratings should consider not just content suitability, but also the purpose, nature and security of the interaction.

[3] Research carried out in 2016 found that the average user touches their smartphone 2,617 a day. https://blog.dscout.com/mobile-touches

[4] A survey of 2,750 UK teenagers aged 11-18 carried out in 2016 found that 23% checked their devices more than ten times a night: http://www.hmc.org.uk/blog/research-teenage-use-mobile-devices-night/

[5] The Internet On Our Own Terms: How Children and Young People Deliberated About Their Digital Rights (January 2017) http://casma.wp.horizon.ac.uk/wp-content/uploads/2016/08/Internet-On-Our-Own-Terms.pdf

[6] Livingstone, Sonia and Helsper, Ellen (2007) Gradations in digital inclusion: children, young people and the digital divide. New media & society, 9 (4). pp. 671-696. http://eprints.lse.ac.uk/2768/1/Gradations_in_digital_inclusion_%28LSERO%29.pdf and Maximising the Opportunities for Kids Online - Where Are We? http://blogs.lse.ac.uk/mediapolicyproject/2014/12/02/maximising-the-opportunities-for-kids-online-where-are-we/

Risk, harm and opportunity

There are two dominant narratives around children and technology. First, that it creates risk of harm and, second, that it creates unmissable opportunities. Too often these narratives are articulated in their most extreme forms leading to conflicting and confusing messages for teachers, parents and children.

It is broadly understood that children must take risks to grow, and that adults should collectively try to prevent them from coming to harm. And that is no different in the digital environment than any other.

Some of the risks are simply an 'outcome' of a child playing in an adult space and not having the developmental capacity to negotiate adult-designed content, behaviour or interactions. Some risks, such as sexual grooming and child sexual abuse, are extreme, and whilst they are absolutely real, they have been pushed to the forefront by tragic headlines. The more mundane and more prevalent risks such as insomnia, obesity, low self-esteem, addiction and oversharing are often overlooked.

Whilst both parents and children report worry about sexual and violent content, bullying and unsuitable material, research shows that children want more information and less e-safety. They want more support to get offline, more protection from unpleasant content, and more control over their digital behaviours.

Digital literacy is also a victim of mixed messages. The digital environment is often demonised, yet the lived experience of most children is that it is a convenient and fun environment, a core component of their lives. Adults also then valorise digital as being the future, where only the fittest (or coders) will survive, which is alienating for the majority of children who do not have those skills.

These two strands do not reflect the multifaceted components of a comprehensive digital literacy framework. Some skills are technical – those who can programme, remix and use open source tools have more 'agency' in the digital environment and more facility to use those design features that exist to support them. But the majority are not technical: collaborative working, an 'iterative' mindset, curiosity and critical thinking can be as important as directly technical skills.

Current strategies of parental controls or taking away phones are far less effective than providing a broad framework of knowledge and competencies. Research shows that digitally literate children take more risks and come to less harm[7].

Parenting in most families mirrors the parenting one has received. How to parent in the digital environment is a unique challenge since there are no existing ground rules for the current generation of parents. This is exacerbated by experienced, senior childhood specialists (e.g. police, social work, teaching, government) feeling far

Current strategies of parental controls or taking away phones are far less effective than providing a broad framework of knowledge and competencies.

from digitally competent. Many feel unsupported by limited credible training and evidence-based information so the ladder of support that traditionally exists in professions operates less efficiently in the digital environment.

Almost all stakeholders agree that there should be education and training for children of all ages, and adults in all settings. But it is not the case that education or building resilience in children is the answer. Parents, carers, children, teachers and frontline workers need high-quality information that promotes digital citizenship, literacy and agency at every stage, from pre-school, through the primary years and into adolescence. They also need the technology to be designed to be responsive to the needs of children. It is necessary for childhood that digital services adapt to the needs and capacities of children of different ages, rather than demand that children, particularly in the youngest age groups, adapt to the structures of technology developed with adults in mind.

Recommendations:

10. Training must be child-centred and sustained to reflect the changing nature of the technology.

11. The Department of Education should make 'cross-curriculum' digital competency a priority in all schools. This includes (non-exhaustively):

- Computer science
- Ethics
- PSHE
- RE & SRE
- Drama
- English
- Pastoral services
- Whole school assembly
- Parents' evenings
- School prizegiving

12. There should be comprehensive and fully-resourced training for those with responsibility for children, from policy makers (ministers, government officials) to frontline practitioners (teachers, health workers, police, magistrates and social workers). This should be based on the UN definition of digital competency[8] and would include, but not be focused on, potential harms. It would form part of professional qualifications and continued professional development. In particular:

- All teacher training should include comprehensive 'digital training' as standard
- Teachers with responsibilities for safeguarding, PSHE, SRE, relationships education and head teachers should have additional specialist training

13. There should be fully-resourced provision of evidence-based high quality information for parents, carers and children at each age of development. This would include, but not be focused on, potential harms, and would be delivered via schools, health centres, councils and other public bodies.

[7] "A risk-averse society will, paradoxically, exacerbate rather than reduce the very vulnerabilities it seeks to protect by undermining the development of resilience. And for teenagers, risk-taking is also important both developmentally and culturally." P.24 of 'Online risk, harm and vulnerability: Reflections on the evidence base for child Internet safety policy' by Professor Sonia Livingstone, 2013

[8] Broadband Commission Working Group on Education Report: Digital Skills for Life and Work (September 2017)

3 – 5 Years

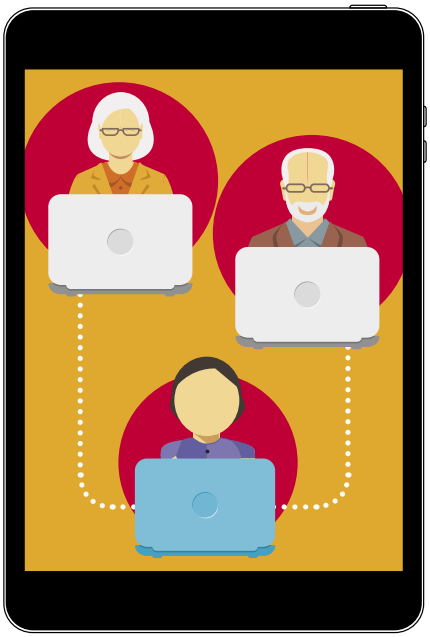
Children are:

Developing a 'theory of mind' and can start to put themselves in others' shoes.

Tending to believe what they see.

Beginning to learn that there are social rules and norms to follow.

Starting to build up friendships – peer pressure remains low, family influence is paramount.



Digital use:

Mainly adult-guided activities (e.g. Skyping Grandma/playing) or in walled environments.

Apps on parents' phones (e.g. games, music), video portals (e.g. YouTube and CBeebies).

Phones widely used by parents as video recorders and cameras.

Information about very young children posted by parents online in social spaces.

Risks & challenges:

Children and adults unaware of the full range of risks, such as information sharing, digital footprint or formation of digital habits (priming).

Parents think their children are engaging with child content only.

Temptation to use devices for 'babysitting'.

Unknown risk of Internet of Things (IoT) (e.g. baby cameras, IoT dolls, household appliances, automation).

Recommendations:

Impact:

Lack of clarity for both children and parents regarding the different benefits and risks in digital spaces (e.g. games, entertainment, communication, walled gardens/closed platforms, unmediated spaces).

Early development is when digital habits are established.

At this very young age, children take their first steps towards independent use of devices but are not yet ready to independently self-manage time.

14. **All technology used by children in this age range should be adult-guided.**

15. **Platforms should develop trusted (non-commercial) systems of peer, parent and teacher reviews to share knowledge and guide adult choices.**

16. **Screen guidelines (which should not focus exclusively on screen time) should be developed, which consider child development requirements.**

17. **Older siblings should be encouraged to 'scaffold' younger family members' digital experiences so that digital media use becomes a sociable activity within families.**

18. **Content filtering may be effective.**

6 – 9 Years

Children are:

More able to manage their thinking and their emotions.

Undergoing a shift towards increased order and logic in their thinking around the age of 7.

Learning about the complexities of relationships.

Moving towards greater rule-based reality play, and away from pretend play.

Becoming socially more sophisticated; the need to fit in and be accepted by the peer group becomes more important.

Digital use:

Entertainment, films, TV, video (e.g. YouTube, Netflix).

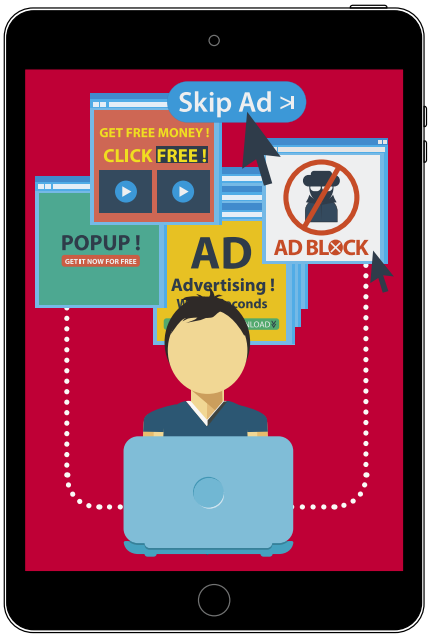
Games and walled gardens (closed platforms – i.e. specialist sites such as CBBC).

Increasing independent use of devices for majority of users.

Independent communication with family and, as they get older, increasingly with friends and third parties (commercial).

Number of children in this age group having smart phones or tablets increasing rapidly.

Children begin using the internet through game consoles and handhelds.



Risks & challenges:

Frequent users of the internet but have limited knowledge of online safety.

Children are predisposed to be compliant with safety messages from school/home, but if risks aren't explained clearly, they create their own explanations.

Children are unaware their web use is tracked and used for suggestions and ads.

Limited critical understanding can mean that neither veracity of information, nor its purpose, are properly understood.

Presence of ads presents a confusing proposition of a consumerist message, but one which is vetted by reputable platforms/providers.

'Tech tantrums', reward loops and auto-plays make it difficult for children and adults to manage use, because their evolutionary biology (need to react) is exploited by random rewards and interventions.

Parents are uncertain of the best way to manage the dilemma of management vs. autonomy, leading to family tensions around digital use.

Internet filtering may be somewhat effective.

Impact:

There is no culture of transition to having independent device.

There can be positive benefits for children who find face-to-face contact challenging.

Gaming becomes a frequent topic of conversation for boys and girls.

Because of a child's in-built need to seek rewards, the 'priming' that is a precursor to gaming, betting and gambling is highly affecting. Ability to know when to stop and turn off may be compromised.

Social norms and habits are being developed that may have future repercussions (sharing personal information, checking devices at night, posting pictures without privacy settings), which may be difficult to break in the future.

Accessing unwanted or unsuitable content can be 'upsetting' or, in certain cases, harmful.

Recommendations:

19. **Children transitioning from adult-dependent to independent use must be given support in a language and format that they can understand.**

20. **Children should be taught social norms of contact with other people (known and unknown). This should not be limited to safety advice and must be sensitive to gender and the needs of children in vulnerable settings.**

21. **Child-centred design standards should anticipate independent child use. For example, they should:**

- Include time outs, easy exit and the ability to switch off auto-play and other excessive gamification techniques
- Demonstrate a commitment to rapid response to reports from children
- Include caregiver oversight privileges verified via third party mechanisms
- Ensure children's data cannot be used to profile them
- Make erasure processes obvious, simple and effective and ensure that unsuitable material is taken down proactively and quickly

22. **Internet filtering is somewhat effective but children must be given support when they come across unwanted content or contact requests, and other upsetting situations.**

10 – 12 Years

Children are:

More likely to question what they see but are still not always able to critically analyse information, so are generally trusting of information they are given.

Spending more time with friends, even though family are still a source of influence. They are aware of social pressures and expectations, and may change aspects of themselves in order to fit in and be accepted by peers.

Experiencing more feelings of shame and show a dip in self-esteem as social comparisons increase.

More aware of what's 'cool' or not, and increased awareness of brands.

Awareness and enhancement of self-image.

Digital use:

Having a personal device is the norm for this age group.

They watch TV/films, shop online, gaming.

Open communication, including photos, with friends across a range of sites, including games and social media.

Schoolwork and communications from school.

This is a time of rapid increase in user numbers. For example, mobile phone ownership rises rapidly in this age group from 32% at age 8-11 years old to 79% of 12-15 year olds[9].

Start to use the online environment to explore and develop their self-identity.

Risks & challenges:

Unaware that searches may be visible to others and that preferences are being used to profile a young child using algorithms.

Unaware that apps/platforms are deliberately designed to extend use and are therefore 'sticky'.

Find it hard to think of the longer-term consequences, and seek immediate rewards e.g. impulsive use (sending photos, posting personal information).

Perception that their personal image falls short of those that inhabit their digital environment, so manufacture their personal image profile to compete with them.

Digital wildfires (gossip), social media groups, notifications, spread of content can become overwhelming.

Increase in family tensions around digital use[9].

Personal privacy not a priority.

Fake news, commercially driven information and 'echo' of personalised news feeds influence a young person's understanding of global issues.

Schools communicating at inappropriate hours.

Impact:

This is potentially the most vulnerable age group.

Young people feel they have failed when unable to live up to agreed terms to moderate use.

Technology designed to extend use exploits human need to react and respond, with orchestrated sound, light and vibrations in rhythms that often result in unconscious use. Children of this age do not have realistic understanding of opportunity cost of overuse, including, but not limited to, interrupted sleep and offline activities.

More tolerant of crude behaviour than older adolescents or younger children.

'Testing' social media to see what 'image', 'popularity' or impact one can have can lead to risky behaviours.

Phone = social integration and FOMO (fear of missing out).

Social media stalking can reinforce isolation for the socially unconfident. Lasting negative impact of cyberbullying.

Potential benefits of online communication for those who find face-to-face interactions difficult. Online social media and gaming offers a way of 'connecting' to new peers.

Pornographic images impacting behaviours and expectations of sex for young people.

Recommendations:

23. **Children receiving a smartphone for the first time should be taught how to use age-appropriate settings and safety features.**

24. **There should be a Year 7 digital education 'reboot' to ensure that all children meet requisite standards for digital literacy and are prepared for more sophisticated use of technology.**

25. **Government should recognise that those aged 10 to 12 are particularly poorly served by current provision of online sites and services.** Children this age tend to fall between those services aimed at the very young, and those aimed at adults.

26. **Since most social media sites allow sign-up from 13, greater effort should be made to prevent under-aged sign up from children aged 10-12.**

27. **Efforts must be made to signpost trusted sources of information and minimise the impact of algorithmic 'tailoring'.** 10-12 is an age at which children begin to be exposed to information but do not yet have the capacity to critically evaluate it.

28. **Children aged 10-12 should be learning computer skills and competencies including coding, user experience, computational thinking, design and collaborative working.**

[9] Ofcom Internet Use and Attitudes Report 2016 https://www.ofcom.org.uk/__data/assets/pdf_file/0034/93976/Children-Parents-Media-Use-Attitudes-Report-2016.pdf

13 – 15 Years

Young people are:

Undergoing significant neuro-psychological changes, leading to differences in the way they perceive emotions and make decisions.

Starting to show more sensitivity to risk, with some developing a more risk-averse preference and some developing a more risk-seeking preference[10].

Characterised by idealism, with a tendency towards polarised thinking.

At a critical stage for development of mental health challenges.

Still having difficulties realising that others can have a different perspective, so may find it hard to work out interpersonal problems.

Highly dependent on peers for a sense of wellbeing. They need to feel as if they are part of a group – yet also want to be viewed as unique.

Increasingly testing boundaries set by parents.

Still comparing themselves with others, which can affect their self-esteem.

Likely to be exploring sexuality and testing adult relationships.

Digital use:

Phone is a key social information and education tool.

Communications with friends, games, gossip, TV/films, shopping, photos, music. Main source of news and factual information.

Use social media for self-expression and to find emotional and other forms of information and support.

Self-generated images are routinely shared. The 'currency' of likes and ratings is very important.

Schoolwork – many learning/educational resources have digital component.

Using public Wi-Fi.

Continue to use the online environment to explore and develop their self-identity.

Risks & challenges:

Risk-taking – not accepting that risks apply to them.

Limited understanding of 'ownership' of platform and app data retained by advertisers, platform owners and other digital services.

Lack of critical thinking/knowledge about the quality and veracity of information.

Unaware that digital profile may be accessed by future education and work places.

Choosing to access adult content.

Internet filtering may be ineffective at this age, particularly with increasing use of wearable technologies.

Family tensions about extended digital use.[11]

Access software/music etc. on illegal/unregulated sites to "get stuff for free".

Increased risk of cyberbullying, and increased worries about self-image and social anxiety.

Impact:

Issue of parental control vs. building autonomy. Parents think their adolescent child can manage their digital use themselves, but then alternate this laidback approach with 'authoritarian' interventions in order to take back control, creating confusion about boundaries.

Impulsivity/compulsion to seek rewards is still high.

Strong focus on personal 'brand' – concentration on time spent curating an online presence. Public image can be discordant with sense of own identity.

Vulnerable to excessive use. Aware when 'over-using', but sometimes unable to stop.

Producing excessive personal data/profiling.

Potential for emotional contagion (positive and negative), including spirals of filtered information that may or may not be of high quality.

Self-esteem can be affected by feedback from others online including, but not limited to, cyberbullying.

Removal from face-to-face contact by less confident young people. Potential for 'social media stalking' leading to further isolation.

Body image issues – increasingly aware of discrepancy between the 'ideal' and their own reality.

Recommendations:

29. Education should include:

- Peer-to-peer sharing
- Critical thinking about online experiences
- Discussion of social and behavioural norms around digital technologies
- Digital skills and citizenship

30. Parents, teachers and adults should acknowledge that 13-15 is a time of growing autonomy. For advice and information to be 'heard' it must be communicated:

- With warmth and openness
- From a young person's perspective
- In supportive (not controlling) language
- With an inquisitive (not censorious) understanding of the digital environment
- With acknowledgment of the differences (and similarities) between generations
- Through safe, secure and private spaces and age-appropriate moderation
- With an understanding of different 'types' of use rather than a focus only on screen time and misuse

31. Industry must acknowledge that children aged 13-15 are particularly susceptible to external stimuli and social pressure. Design standards and reporting mechanisms must:

- Control fast spread of information and misinformation (digital wildfire)
- Help children control their reputation and digital footprint
- Ameliorate the pressure children feel to follow peers in showing off and shouting out
- Recognise that this is an age where children are disproportionately exercised by shame and embarrassment
- Make it easy for children to reverse rash decisions
- Give greater support to young people who have been bullied and victimised online

[10] 'Neural Correlates of Expected Risks and Returns in Risky Choice Across Development' by Anna C.K. van Duijvenvoorde, Hilde M. Huizenga, Leah H. Somerville, Mauricio R. Delgado, Alisa Powers, Wouter D. Weeda, B.J. Casey, Elke U. Weber and Bernd Figner Journal of Neuroscience 28 January 2015, 35 (4) 1549-1560; DOI: https://doi.org/10.1523/JNEUROSCI.1924-14.2015

[11] A survey carried out in the US by Common Sense Media found that 36% of parents and 32% of teenagers reported that family arguments about devices occurred on a daily basis: https://www.commonsensemedia.org/sites/default/files/uploads/research/2016_csm_technology_addiction_executive_summary.pdf

16 – 18 Years

Young people are:

Presenting as if an adult but have not yet developed longer sense of consequence as adults, and brain is still maturing into the mid-20s.

Starting to form close partnerships in relationships. May feel invulnerable and above the rules.

Predominantly influenced by peers, with intense intimate relations being prioritised. The family and family values are, however, still an important influence on behaviour.

More settled within peer groups.

More challenging of conventional wisdom and more trusting of peers.

Digital use:

Independence – parents give adolescents almost complete authority over screen use.

Communications with friends, games, gossip, TV/films, shopping, photos.

Open communication across a range of sites.

Visual communication remains vital and the 'currency' of likes and ratings is very important.

Learning/educational resources and information about education choices is largely accessed from digital environment.

Expressing themselves (e.g. using image macros).

Use social media to gain and maintain social support.

Digital primary source of news, information and public views.

Avid users but small percentage of maker contributions – particularly girls.

Risks & challenges:

Risk taking still an issue; influenced by a heightened sensitivity to social and environmental cues.

Maybe unaware those who control apps (e.g. FB) own their public and private social media content.

Adolescents unaware universities scour their social media presence as part of admissions process[12].

Adolescents and parents may be unaware their web history is not private (IP law) and is stored for 12 months and searchable by councils and charities.

Identity fraud risk increases as adolescents purchase more online.

Future of work is immeasurably transformed by automation – yet many young people do not have the requisite understanding or skills.

Fear of 'lack of privacy' when accessing online services can stop young people getting the help they need, especially as more and more services go online.

Internet filtering may be ineffective at this age and may not be required in all jurisdictions.

Overexposure of female bodies against a sexualised language that inhibits girls and women from a public profile.

Family tensions about digital use.

Impact:

Many of the 13-15 year group issues still pertain in this age group and require further, more sophisticated age-appropriate information regarding:

Self-esteem

Cyberbullying

Body image

Impulsivity/compulsion

Excessive use

Removing of oneself from social context

Self-regulating made difficult by design

Personal 'brand'

Producing excessive personal data/profiling

Potential for emotional contagion

Gender outcomes online

In addition, there are anxieties of impending requirements of adulthood. This transition is not defined in the digital environment, with very few services (among exceptions for gambling, commercial pornography and financial services) distinguishing between a child and adult user.

Recommendations:

32. **Education and services should focus on preparing children for the transition to adulthood.**

33. **Education providers should offer career advice and training in:**

- Technology
- Automation
- The Internet of Things
- Machine learning
- Coding
- Code remixing
- Digital content and service design

34. **Education providers should provide support on:**

- Reputation management
- Monitoring their digital footprint
- Understanding and using privacy settings
- Using government and commercial services online
- Financial matters
- Understanding credit agencies
- Knowing how to access trusted and confidential advice on sexual, psychological, emotional and health concerns
- Deleting and archiving personal materials

35. **16-18 year olds should be encouraged to co-create training and information for those younger than them, in both family and educational settings.**

36. **Assuming children have age-appropriate design as a norm, industry should alert young people as they approach 18 years of age to the differences in the service that will come into place when they reach adulthood.**

[12] 40% of admissions staff said they look at applicants' social media pages to learn about them. Kaplan Test Survey 2015 published January 2016. http://press.kaptest.com/press-releases/kaplan-test-prep-survey-percentage-of-college-admissions-officers-who-check-out-applicants-social-media-profiles-hits-new-high-triggers-include-special-talents-competitive-sabotage

In conclusion

Although the digital environment is ubiquitous in children and young people's lives, services are rarely designed specifically for them or adapted with their development needs in mind. This is particularly true for older children who experience the digital world with few or no concessions to childhood. This means that digital environments, though much loved by children and young people, can be confusing and sometimes hostile for a young person.

Excluding children and young people from the digital environment is not an option. It is essential for a 21st century child to access and benefit from the opportunities it offers. To do so, they must have the skills and knowledge to navigate this environment but, more importantly, for it to be responsive to their needs at all ages and stages of their development.

Parents and teachers have responsibilities to help children make good choices in their lives, both on and offline, but they cannot fulfil those responsibilities unless strategies and tools for users of different ages are available. This is the responsibility of all who provide digital services and platforms.

It is the price of doing business. It is a responsibility of national and devolved governments. It is a cultural and economic necessity, because the future is digital and the next generation must be able to navigate that environment creatively, knowledgeably and fearlessly.

Much of the current emphasis on children and the digital environment is predicated on responsible digital behaviour of children, during periods of development where they do not possess the maturity to manage the impact of what they do or see. Responsibilities of children must be age-appropriate and weighted against the contexts in which they find themselves.

What children and young people need in the digital environment is a managed journey and access to the same privileges, supports and rights as they enjoy in the analogue world.

Author Biographies

Baroness Beeban Kidron OBE is a crossbench member of the House of Lords and a member of the House of Lords Communications Committee. She is a Commissioner on the UN Broadband Commission for Sustainable Development and is a member of its education working group, the Royal Foundation's Taskforce on the Prevention of Cyberbullying and the Children's Commissioner for England's Growing Up Digital Taskforce.

She is the founder of 5Rights, a campaign that delivers the established rights of children in the digital environment. She is working with children to design and build technological solutions to help them be creative and informed in the digital environment. Current partners include BT and Accenture Innovation.

Kidron has been an award-winning filmmaker for nearly 40 years and co-founded the educational charity IntoFilm, which uses film to educate children and has over 17,000 film clubs in UK schools.

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Angharad regularly consults on child development and wellbeing to non-clinical organisations. She provides input to the media on child and adolescent mental health and has appeared on television and radio as an expert on child and family issues.

Contributor Biographies

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Miranda's particular interests are in relation to evaluating the impact of services, considering best models of early intervention and determining how young people and their families can best be supported to make informed choices and build on existing strengths.

Miranda is also director of the Child Outcomes Research Consortium, a collaboration of specialist mental health professionals committed to meaningful use of evidence to enable more effective child-centred support. Miranda was awarded an MBE in 2017 for her services to child and young people's mental health.

Prof. Joanna R. Adler is Professor of Forensic Psychology at Middlesex University. She is a BPS- and HCPC-registered Forensic Psychologist. Joanna has been conducting research and evaluating interventions in and around youth justice for more than two decades. Joanna applies both qualitative and quantitative approaches to her research and has conducted several systematic reviews of evidence. Whether exploring how young people respond after victimisation, or considering efficacy of sanctions imposed on those who have offended, findings have led her to believe that it has never been more important to consider the impact of real and digital blended identities on young people's experiences and development from youth across the lifespan.

Prof. Andrew K. Przybylski, University of Oxford, is an experimental psychologist based at the Oxford Internet Institute. His work is mainly concerned with applying psychological models of motivation and health to study how people interact with virtual environments including video games and social media. Professor Przybylski is particularly interested is integrating open, robust, and reproducible science with evidence-based policymaking in the digital age.

Dr. Elvira Perez Vallejos, Nottingham University, is an Associate Professor for Digital Technology for Mental Health at the NIHR Nottingham BRC Mental Health. She is interested in the ethical challenges of introducing AI (Artificial Intelligence) and Deep Learning methods on the development of virtual human therapists. She has experience in RRI (Responsible Research and Innovation) and Data Ethics as well as on the Internet of Things (IoT), Data Privacy, Research Ethics, Human Factors, Creative Practices for Mutual Recovery, Experimental Psychology, Participatory Research, Children and Young People, Older Adults and Co-Production.

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Dr. Julian Edbrooke-Childs is Head of Digital Development and Evaluation at the Anna Freud National Centre for Children and Families, Lecturer in Evidence-Based Child and Adolescent Mental Health at University College London and Co-Research Lead for the Child Outcomes Research Consortium. His work uniquely bridges the worlds of research and practice in relation to supporting the mental health of children and young people. His research agenda focuses on how to understand child mental health difficulties and how best to support children, young people and families to build on their own strengths to overcome and manage their difficulties and aid recovery. His research covers three domains: a) person-centred care, b) implementation science and c) digital innovation, and draws on evidence derived from multiple methodologies, both qualitative and quantitative, including framework analysis, regression analysis and multilevel modelling.

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