

Online Experiences and Safety of Neurodivergent Young People: A Mixed-Methods Study

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Abstract

Neurodivergent young people may experience the internet in ways that differ from their non-neurodivergent peers, yet their perspectives remain underrepresented in research. This mixed-methods study explored the online experiences, safety concerns, and perceived digital skills of 57 neurodivergent young people aged 11-13 and 39 parents. Young people took part in internet safety workshops and completed a digital skills questionnaire; parents completed parallel questionnaires about themselves and their child. Reflexive thematic analysis identified three themes: 'A Social Space', 'A Personal Space' and 'A Risky Space'. Quantitative findings indicated that doxing and scams were the most commonly cited concerns among those presented. Young people rated their digital competence relatively highly, while parents gave slightly lower ratings, $t(15)=2.163$, $p=0.047$, $d=0.54$. Findings suggest that online safety for neurodivergent young people is related to interactions between individual, social, and platform-level factors. We present a conceptual framework of these influences and discuss implications for research, education, parents, and technology design. Although identifying some areas of vulnerability and risk, our findings also challenge present deficit-oriented narratives around online vulnerability for neurodivergent young people.

CCS Concepts

• **Human-centered computing** → Accessibility; • **Social and professional topics** → User characteristics; Age; Children.

Keywords

neurodivergence, young people, online harms, digital safety, accessibility, technology, design, mixed-methods

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1 Introduction

Recent cross-national data suggests at least 50% of 15-year-olds spend 30 hours or more a week using digital devices [39]. This consistent exposure to the internet places young people at a significant risk of experiencing a range of online harms [10]. More than 70% of young people have seen content they found concerning online [20]. While some specific areas of online harm, such as cyberbullying, have been intensely researched, other areas remain relatively under-researched, such as the safe sharing of information. Furthermore, research into youth experiences online often overlook certain populations of young people who may face unique vulnerabilities and challenges online.

Some research suggests young people who require additional learning support, including many neurodivergent learners, may face heightened exposure to online harms [3, 18]. Neurodivergence is the term used when an individual's brain processes, learns or behaves differently to the prevalent societal norms [49]. This includes conditions such as dyslexia, attention deficit hyperactivity disorder (ADHD), autism, or intellectual disability.

Neurodivergent young people may encounter online risks differently because of characteristics associated with neurodivergence, including differences in executive functioning, social communication, attention, and information processing, may interact with platform design and safety demands [30]. These differences may affect tasks such as judging risk [13], interpreting social intent [41], managing privacy [1], resisting scams [13], or navigating complex interfaces [2]. However, neurodivergence may also be protective in some contexts, for example where strong technological interests, caution, or preference for lower-social-demand environments support safer online engagement [40].

While prior research has examined neurodivergent young people's online experiences [3, 18, 36, 41, 47], existing work has focused predominantly on autistic young people [17, 22, 40, 45, 49], with less attention to broader neurodivergent experiences. Research shows that there are significant co-occurrences between different areas of neurodivergence (e.g. 50-70% of autistic people also have co-occurring ADHD) [26]. Previous research also tends to use proxy reports – asking parents, caregivers and professionals rather than the young people themselves about their experiences of online harms [35]. Ringland [46], for instance, explored how parents helped to curate safe spaces online for their autistic children but identified a need for more research focused on the viewpoint of the

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children themselves. This is reflective of an increasing acknowledgment of the importance of neurodivergent voices in research [25]. For example, there have been calls for more involvement of young neurodivergent individuals in technology design, as the experiences of neurodivergent young people are often secondary to usability for non-neurodivergent users [50]. Therefore, the current study sought to understand the unique experiences of neurodivergent young people online, focusing on three aspects of online harms: safe sharing of personal information [55], privacy/security [1] and scams [21]. These areas were selected because they are relatively under-researched compared with harms such as cyberbullying, yet are theoretically linked to cognitive processes commonly associated with neurodivergence, including executive functioning, risk evaluation, and information processing.

2 Related Work

2.1 Protective factors, affordances, and diversity of experiences

Not all impacts of neurodivergence online are negative. Evidence suggests some neurodivergent young people may engage in fewer risky online behaviors than their peers. Rocheleau and Chiasson [47], for instance, found autistic adolescents prioritized privacy and safety - often motivated by heightened awareness of extreme threats such as kidnapping or identity theft. This heightened risk sensitivity, sometimes described as “catastrophizing”, may act as a protective factor, deterring them from behaviors that could compromise safety. Similarly, many autistic and ADHD young people use online spaces to pursue special interests, build meaningful connections, and engage in sensory regulation activities, such as through gaming or video platforms [22, 43]. Studies have also shown that some neurodivergent young people report using online videos and gaming as a way to self-regulate emotions and gain a sense of agency [43]. These examples highlight the dual role of online engagement: while vulnerabilities are real, digital environments can also offer opportunities for agency, self-regulation, sensory exploration, and belonging.

The complexity of these affordances is also illustrated in the work of Page et al. [41]. Drawing on interviews with autistic individuals, as well as parents and staff, the study showed autistic people sometimes interpret technological affordances, defined as the possibilities for action that technology provides [15], in different ways that can produce unintended consequences. This research showed that what may appear to be “risky” behavior is not always a product of carelessness or disregard but may instead reflect alternative interpretations of how digital platforms can and should be used.

2.2 Neurodivergent young people and online vulnerability

However, previous research has also suggested that neurodivergent young people may face a greater risk of online harms, such as cyberbullying, grooming or exposure to inappropriate content compared to their peers [14]. For example, Bannon et al. [3] conducted focus groups with adolescents who had additional support needs and identified two themes. The first, Identity and Connectedness,

described the participants’ sense of belonging, how they developed independence and competence online as well as their use of the internet to cope and learn. The second theme, Issues Relating to Risk, participants described intentional risk-taking online, often motivated by a desire for social acceptance, even when they were aware of potential dangers.

Differences in executive functioning, commonly observed in neurodivergent individuals such as those who are autistic, dyslexic or ADHD, may also contribute to online vulnerability. Impulsivity, difficulties with behavioral regulation, and reduced capacity for task-switching in ADHD have been linked to both offline and online risk-taking behaviors [37, 45]. By evaluating their social and behavioral adjustment at ages 13-14 using observational coding, Mikami et al. [37] found that early adjustment predicted both the propensity and the quality of online interactions.

Similarly, in qualitative interviews, autistic young people aged 11-17, have reported particular vulnerability to socially oriented harms, such as cyberbullying, social exclusion, or sexual harassment [36]. Furthermore, participants in Macmillan et al. [36] demonstrated difficulties in controlling unwanted online contact and spoke of a need for improved support, particularly in terms of visual aids. Other research [12] has shown the need for mediation and monitoring of online usage by the support networks in young people’s lives in order to assist with online safety.

Dyslexia presents different risks - adolescents with dyslexia have described accessibility barriers when navigating dense or jargon-heavy privacy policies and challenges with secure password management, potentially leaving them more vulnerable to privacy breaches and security threats [1]. Furthermore, research with young people with intellectual disabilities has also found difficulties with socio-technical factors, such as difficulty with spelling words for search queries, authentication challenges and ads [4]. These findings suggest that while the types of risks may vary across different forms of neurodivergence, structural and cognitive factors interact in shaping young people’s online experiences.

2.3 Theoretical frameworks for understanding young people’s online safety

There are many different theoretical approaches to understanding young people’s online safety. These include relatively simple risk classification frameworks [33], which are widely used in policy research and are helpful in categorizing harms (e.g. content, contact, conduct, contract). However, these are less useful in explaining how and why risk and protection emerge and any dynamic, bidirectional influences that are involved. Socio-technical and affordance-based perspectives [9] focus on how platform design influences behavior. These frameworks are strong on accessibility, governance, and design aspects, but can sometimes neglect influences such as the wider developmental context, support networks, and individual factors such as neurodivergence.

Bronfenbrenner’s ecological systems theory [8] provides a more holistic framework for understanding the different influences on an individual child, from proximal settings such as family, peers and schools (microsystem) to broader societal, cultural, and policy influences (macrosystem). Importantly, the bioecological perspective also emphasizes the reciprocal interactions between an individual

and their environments. Building on this perspective, Takeuchi and Levine [51] argue that digital media should be understood as an integral part of modern developmental ecology, reflecting the increasingly interconnected role of online spaces in young people's lives. Ecological approaches have therefore become increasingly influential in research on online safety. For example, Livingstone and Byrne's [31] research situated parental responsibility within a network of interacting systems including platform design, education, national policy and cultural norms. Similarly, Patel & Quan-Haase [42] adapted Bronfenbrenner's framework to develop a social-ecological model of cyberbullying, incorporating digital-specific factors within each ecological system (microsystem, mesosystem, exosystem, macrosystem and chronosystem) as well as a separate 'digital context' system. Their model centers young people's perspectives and helps to uncover the complex interactions among the multiple factors and contextual influences that contribute to cyberbullying. Their model provides a valuable foundation that can be extended to conceptualize online risk and resilience among neurodivergent young people, where individual neurodevelopmental characteristics interact dynamically with family support, educational environments, digital platform design and wider societal structures. In the present study, we draw on the ecological systems theory on reciprocal influences between the young person and their immediate social and technological environments. We do not attempt to reproduce every ecological system level; instead, ecological theory is used as an organizing framework for the relationships observed in this sample.

2.4 Gaps in existing research

Despite growing recognition of the importance of online safety for neurodivergent young people, important gaps remain in the literature, which the present study attempts to address. The majority of research has focused on autism, often neglecting other areas of neurodivergence (e.g. ADHD, dyslexia) [18]. Furthermore, much of the literature relies on proxy reports from parents or professionals [16, 41], with limited direct engagement with neurodivergent young people themselves. This risks under-representing their voices and potentially framing them as uniformly vulnerable or experiences as predominantly negative, rather than capturing the diversity of experience. Furthermore, most studies focus on risks within social domains (e.g., cyberbullying) while neglecting other harms such as scams, misinformation, or accessibility barriers. There are also few conceptual frameworks that holistically describe the different contextual factors that influence online safety in this population.

3 Research questions

This exploratory mixed-methods study examined how neurodivergent young people aged 11-13 navigate risk and resilience online.

3.1 Sub-questions:

RQ1. How do neurodivergent young people perceive the benefits and harms of their everyday online activities?

RQ2. What knowledge and skills do they demonstrate in relation to key online safety domains, including sharing personal information, privacy/security, and scams?

RQ3. What sources of support influence their online safety experiences?

Building on the theoretical approaches introduced in Section 2.3, ecological ideas informed the interpretation of the study. The qualitative and quantitative findings were subsequently integrated into a descriptive conceptual synthesis of how platform affordances, accessibility of safety information, social context, and individual profiles may interact within this sample.

We focused on ages 11-13 because this is a key developmental period for digital intervention [44]. To promote meaningful engagement in the study, data was collected during interactive and educational workshops that the research team ran in schools, focusing on three types of online harms (Sharing Personal Information, Privacy/Security and Scams). Workshops were used to accommodate different sensory and cognitive needs as well as expression through art and creative mapping which can be beneficial for individuals who may find verbal or written communication challenging [17]. We also collected information from parents and caregivers, via a questionnaire.

4 Methods

4.1 Participants

Fifty-seven young people aged 11-13 ($M=12.08$, $SD=0.74$, 22 identified as female, 31 male, 1 non-binary and 3 were un-disclosed) and 39 parents (aged 30-52, $M=40.56$, $SD=5.88$, 37 female, 2 male) took part. Table 1 shows the distribution of neurodevelopmental condition as disclosed to us by either the parents, the school or both. Many participants had co-occurring conditions. Within our participants we included young people who: (a) self-identified as neurodivergent, (b) had a diagnosed or suspected neurodevelopmental condition (e.g., autism, ADHD, dyslexia), and (c) were identified by their school as receiving additional learning support, but who did not disclose their specific neurodivergence/neurodevelopmental condition, but who may have broader emotional or behavioral differences. Most young people in the study had either a diagnosis of, or were on wait lists for, autism, ADHD, dyslexia or learning difficulty.

4.2 Recruitment & Ethics

Recruitment was conducted in seven secondary schools across South Wales. Schools were informed that the project was focused on neurodivergent students, including those with ADHD, autism and/or dyslexia; a formal diagnosis was not required due to long NHS (National Health Service) waiting lists, so a needs-based approach was used.

Sessions were facilitated by a researcher with experience working with neurodivergent children in school settings and followed school and university safeguarding policies. Data were anonymized when uploaded for analysis; audio files were stored on secure university servers in compliance with GDPR (General Data Protection Regulation). Parents provided consent for all young people who took part due to their age; young people were provided with an age-appropriate information sheet and provided assent, which was continuously monitored throughout the study. The young people were free to withdraw from the workshops at any time, and no monetary incentives were offered to parents or young people. The study

Table 1: Table of Participant Suspected or Diagnosed Neurodevelopmental Conditions

Neurodevelopmental Conditions	Frequency
Autism (Diagnosis/Suspected)	32
ADHD (Diagnosis/Suspected)	12
Dyslexia (Diagnosis/Suspected)	4
Cognitive Learning Needs (Diagnosis/Suspected)	11
Additional Learning Support	12

^a Numbers exceed total participant numbers as some participants with multiple diagnoses appear in more than one category.

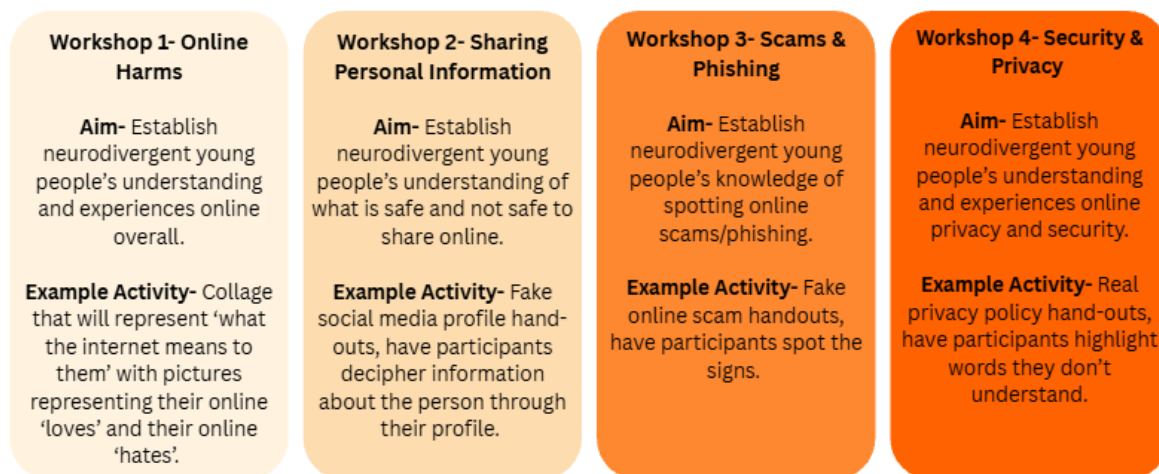


Figure 1: Shows the outline of the four workshops, including the sessions' overall aim and an example activity.

was granted ethical approval by the institutional ethical committee [EC.24.02.13.6944R2A2].

4.3 Workshop Design

One-hour workshops were delivered weekly over four weeks in each participating school (28 total workshops; Figure 1), with groups sizes ranging from 5 to 11 participants. Sessions were conducted by the same researcher for consistency, with school staff present to support individual needs. Workshops also allowed us to both gather data for research purposes and to educate the young people about different online harms at the same time.

Workshop 1: introduced online harms and explored young people's existing experiences. Participants created collage mind-maps to represent "what the internet means to me" and completed a ranking task to prioritize different online harms. These activities captured both lived experiences and perceived concerns.

Workshop 2: focused on the safe sharing of personal information. Activities included a mapping exercise about how information is shared differently across different platforms (data not included as not directly relevant to the research questions). Data from the digital skills questionnaire about sharing information was included.

Workshop 3: Addressed privacy and security. Participants reviewed excerpts from platform privacy policies, identifying unfamiliar terms and commenting on readability and accessibility. This

activity explored barriers to understanding online safety information.

Workshop 4: Focused on scams and phishing. Participants completed a "spot the scam" task, evaluating messages and posts to determine whether they were legitimate or fraudulent, and explaining their reasoning.

Workshop activities were developed by the research team drawing on prior online safety materials (Google's Be Internet Awesome campaign), existing literature ([1, 37, 41], and piloting with a small group of neurodivergent young people. While neurodivergent young people were not involved in the formal co-design of the workshops, members of the research team are neurodivergent. Each workshop concluded with a brief reflection task, where participants identified challenges and suggested improvements to online safety practices. When developing the workshop materials, it was important to ensure they were both visually appealing while maintaining a font and color scheme that would be accessible for the neurodivergent young people. A beige rather than white background was used for all materials following British Dyslexia Association readability recommendations [7]. Visual images, graphics and videos were also included and text minimized.



Figure 2: Photos taken during the workshops, the first shows a collage created by one of the participants and the second shows the workshop slides being delivered.

4.4 Instruments

4.4.1 Young Person Questionnaire. We developed a child-friendly mixed-methods questionnaire by adapting existing measures to the study aims, age group, and accessibility needs [11, 19, 23, 60]. It included 19 questions on internet habits, digital skills, and one open-ended question (Supplementary Material 1).

Participants completed the questionnaire during workshop one and then subsequently completed one skill-based matrix question relevant to each workshop topic in the following three workshops. For each skill-based matrix question there were four statements. For example, the question “How would you rate your skills on the following online tasks: Create Strong Passwords” was included in the skill set questions for the privacy/security workshop. These skill-based questions were rated on a Likert scale from “1- I can do this very well by myself” to “4- I don’t know what this means”. To support accessibility and reduce cognitive load, the questionnaire followed the same visual format as the workshop materials. A beige background was used in place of white, and graphic icons (e.g. social media logos) were positioned alongside relevant items to support comprehension.

4.4.2 Parent/Caregivers Questionnaire. To draw comparisons between self-reports of parents/caregivers and their children, parents/caregivers of the young people completed a similar measure about both their own online habits and skills and their children’s. This included 31 questions, with the majority being similar multiple-choice and Likert scale questions to the young person questionnaire (Supplementary Material 2). The parental/carer questionnaire contained an additional open-ended question to the young person questionnaire that asked, ‘Do you think your child’s neurodevelopmental condition or neurodiversity impacts their online safety, if yes in what ways?’ and questions about internet usage such as ‘How often does your child participate in the following online activities at school and at home (by online this could be via a mobile phone, computer, tablet, game console or another device connected to the internet)?’. The usage matrix questions were measured on a

6-point Likert scale from ‘Never’ to ‘Several times every day’ and parents responded on their own usage as well as their child’s.

4.5 Data Analysis

All workshops were audio recorded; these were first transcribed using Microsoft Word’s (Version 2503; 2025) in-built transcription service then checked by the researcher for validity. Collages were entered into NVivo (Version 14; 2023) for initial coding. Data from the ranking activity in workshop one and Likert questions from the parental and young person questionnaire were analyzed in IBM SPSS Statistics Version 29.

A convergent parallel mixed-methods design (Figure 3) was used in this study to provide comprehensive insight into the research questions. Qualitative and quantitative data was collected concurrently, analyzed separately and then integrated to inform the development of a framework that described the different factors influencing neurodivergent young people’s experiences online.

Qualitative data was interpreted using two methods: reflexive thematic analysis following the six-phase approach outlined by Braun and Clarke [5, 6] and qualitative content analysis [27]. Reflexive thematic analysis was selected for analyzing the workshop collages due to its flexibility and suitability for identifying patterns of meaning across datasets. Initial coding for the thematic analysis took place using NVivo to capture participants’ meanings. Word clouds were generated from the initial coding (Figure 4). These word clouds supported the familiarization and early coding process by highlighting the most frequently occurring codes. These initial patterns informed the development of themes, which were then subjected to more detailed review. During this phase, several overlapping themes were consolidated to form the final thematic structure. A raw data example of ‘getting viruses’ was coded as ‘Viruses’ and then would be placed under the theme of ‘A Risky Space’. Constant comparison between the original collages, the memo-writing as well as the codes supported the refinement of the final themes.

Due to the parent response data being more limited, qualitative content analysis [27] was selected for analyzing the open-ended

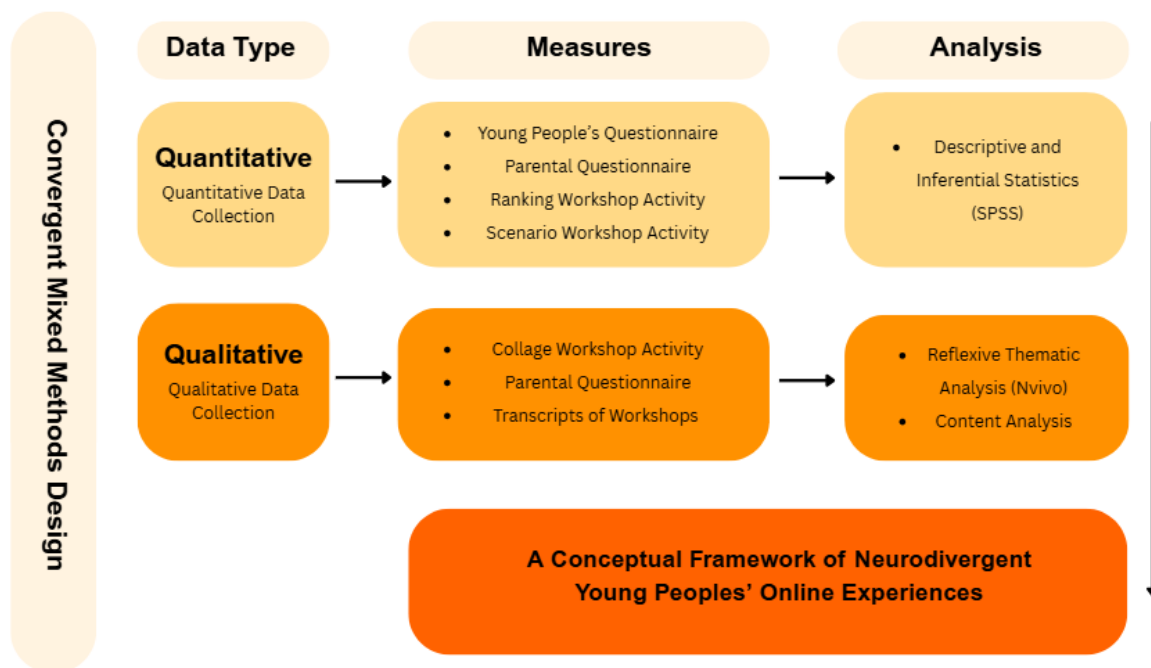


Figure 3: Shows the outline of the data collection procedures as well as the analysis plan for the collected data.

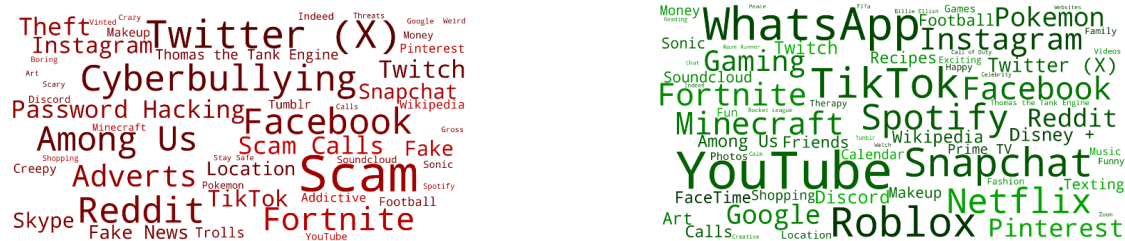


Figure 4: Word clouds generated from the initial coding of the negative (red, left) and positive (green, right) codes from young people's collages. The bigger the word appears, the more times the code appeared throughout young people's collages.

question: “Do you think your child’s neurodevelopmental condition or neurodiversity impacts their online safety, if yes in what ways?” Responses were read repeatedly to ensure familiarization and begin to identify any recurring ideas. Responses were then grouped into codes based on concise descriptions of each response. These codes were then assigned to categories by comparing codes to determine which codes belong together. Once categories were established, the frequency with which each category appeared was calculated. This allowed for identification of the most prominent ideas reported by participants.

All data analysis processes were discussed amongst the wider research team. During both the workshops and data analysis, memo-writing was undertaken to provide further thoughts and insights as well as any reflections.

Quantitative questionnaire data were analyzed in SPSS using descriptive statistics and inferential tests. Assumptions of normality and homogeneity of variance were assessed prior to analysis. Statistical significance was set at $p < .05$. Findings from the qualitative and quantitative analyses were integrated at the interpretation stage to inform framework development.

4.5.1 Positionality and Reflexivity. Analysis of the data was collaborative with codes and themes discussed with the wider research

team throughout the process. The lead researcher engaged in ongoing reflexive journaling and memo-writing throughout data collection and analysis, to critically reflect on how their positionality may have influenced interpretation.

The research team brought a range of personal and professional experiences relevant to the study population. While not identifying as neurodivergent, one researcher has close family experience of neurodivergence, which may have heightened sensitivity to issues of accessibility, communication, and marginalization within participants' experiences. It is acknowledged that close family experience does not inherently position an individual within neurodivergent advocacy frameworks. For this reason, it is not the authors' intention to present lived adjacency as a substitute for engagement with neurodivergent voices, research and ongoing reflexive practice.

Another team member, who is dyslexic, was conscious that their background could have led to more focus on readability and accessibility related to platform factors. However, this team member was able to contribute insights into readability and sensory accessibility in the design of workshop materials. During the workshops, clarifying follow-up questions were used to further understand participants' intended meanings. These exchanges were considered within the researcher's wider interpretive role.

5 Findings

5.1 How do neurodivergent young people perceive the benefits and harms of their everyday online activities? (RQ1)

To address RQ1, we first explored young people's existing online experiences - what they encountered, whether these experiences were positive or negative, and whether concerns about online harms emerged spontaneously prior to prompting. This was done through a collage activity where the young people answered the question "What does the internet mean to me?". Thematic analysis was conducted on the collages produced in workshop one (examples shown in Figure 5), and three themes relating to the young people's perceptions of benefits and harms were identified: (1) A Social Space, (2) A Personal Space, and (3) A Risky Space. A key pattern across the first two themes was that there was substantial overlap between applications associated with positive experiences and those associated with negative ones. Consequently, although certain applications were described as sources of enjoyment and entertainment, they simultaneously functioned as sources of stress and less favorable experiences. The final theme of 'A Risky Space' was solely expressed in terms of negative experiences either personally, or of other individuals such as friends or family members. The themes are discussed in more detail below.

5.1.1 A Social Space. 'A Social Space' captured neurodivergent young people's views that online spaces enabled them to communicate in ways that were at times perceived by the young people as 'easier' than offline interactions. This theme also included other perceived benefits such as the ability to share content such as photos or videos and being able to keep in touch with friends and family:

"I have a lot of contacts...family and friends that live far away."

Platforms such as Facebook, Twitter/X, Snapchat and Reddit all frequently appeared in both the likes and dislikes sections of many young people's collages, suggesting they have mixed feelings about the benefits of these social media applications. At the same time, young people also expressed several concerns around social media and communication relating to encounters with other users and exposure to inappropriate content:

"People post weird things on Reddit."

Beyond interpersonal risks, other participants highlighted accessibility barriers. For example, one young person noted they had difficulties with navigating platform interfaces:

"I don't really know how to use it; its complicated there's loads of buttons."

5.1.2 A Personal Space. 'A Personal Space' encompassed participants' views that online spaces benefited them by enabling them to engage in personal hobbies and interests such as reading, researching and gaming. Participants referenced platforms and activities such as Pinterest, reading and recipes and researching topics of personal interest. Participants also described the use of games and applications such as Fortnite, Among Us and Spotify for relaxation, immersion and emotional regulation.

"It's calm"

"This is the reason I like it; it's basically creatures that fight each other but don't die."

These comments suggest online gaming environments may function as spaces of controlled stimulation and predictable interaction. Several young people also described exploring 'special interests' using the internet including researching historical events or looking up bus timetables.

Several platforms appeared in both the 'likes' and 'dislikes' sections of participants' collages, while others, like Roblox, Rocket League and Netflix were only mentioned positively. Many young people also expressed concern about the reliability of information found online. In particular, websites such as Wikipedia were commonly mentioned in relation to the possibility of inaccurate or false information due to the open editing:

"Wikipedia is fake"

Several young people also raised concerns about excessive use and difficulty disengaging. One participant commented:

"I literally play games on a daily basis for god knows how many hours a day."

This illustrates an awareness of gaming's potentially addictive nature.

5.1.3 A Risky Space. 'A Risky Space' is the only theme that consists exclusively of young people's reported perceptions and concerns regarding the risks and harms of the internet. Participants described both personal negative experiences online but also incidents that had affected friends or family members:

"One of my mates at school got his gaming console hacked"

Participants spoke of harms such as scams, hacking, and viruses indicating awareness surrounding the risks online, some participants also described their dislike for adverts and pop-ups due to



Figure 5: Examples of collages produced by different young people during workshop one.

their perceived disruption of content as well as perceived threat of scams. There were also suggestions that some of these risks are platform level:

“Hard to moderate”

In addition to naming specific harms, participants also made use of emotive descriptors such as *“creepy”*, *“gross”* and *“scary”* to describe different aspects of their online experience.

Participants also gave insight into their usage as part of the questionnaire by recording which apps they use. The most reported apps used by neurodivergent young people (N=57) were YouTube (N=49), Roblox (N=41), and TikTok (N=32). Parents (N=38) reported their children used YouTube (N=33), Roblox (N=25) and Minecraft (N=24).

5.2 What online harms are most (relatively) important?

While the collage activity established that online harms were spontaneously mentioned as a negative online experience by the young people in our study and we had an initial idea of which online harms they had experienced, we next sought to find out more explicitly which online harms the young people felt were most important or impactful. The young people were given a ranking activity to complete in workshop one (see Figure 6), where they were asked to rank a set of online harms (cyberbullying, scams, cyber threats,

doxing, fake news, impersonation and grooming) from ‘most worried about’ to ‘least worried about’. These harm categories were researcher-defined based on prior literature [48, [1], [21] however, participants were free to include others if they wanted.

On average, the young people placed ‘Doxing’ as the online harm they were most worried about within the options provided, with 11 participants reporting it as their number one online worry (Figure 7). ‘Scams’ was the most reported online worry with 32 participants ranking it somewhere in their top five. After reverse scoring each ranking, i.e. a ranking of 1 being scored as a 6, Scams’ was also the highest scoring online harm overall (N=144) followed by cyberbullying as number two (N=138). Some participants chose to write in their own categories of online harms into their rankings. 26 other online harms were reported by young people these included things such as Inappropriate Videos, Hate Speech, Ads/Pop Ups and Trolling.

While not directly reflected in the ranking activity data, young people also spoke frequently about the addictive nature of social media and the internet, one participant stated: *“TikTok doesn’t get boring its addictive”* and another spoke of their screen time *“My most hours on TikTok ever is like 10 hours”*. However, while the young people openly expressed experiences such as addiction as well as other negative behaviors online, they often downplayed the significance of these issues, *“To be honest, I’m a bit of a rulebreaker, like for example, don’t friend request someone you don’t know, I do that”*.

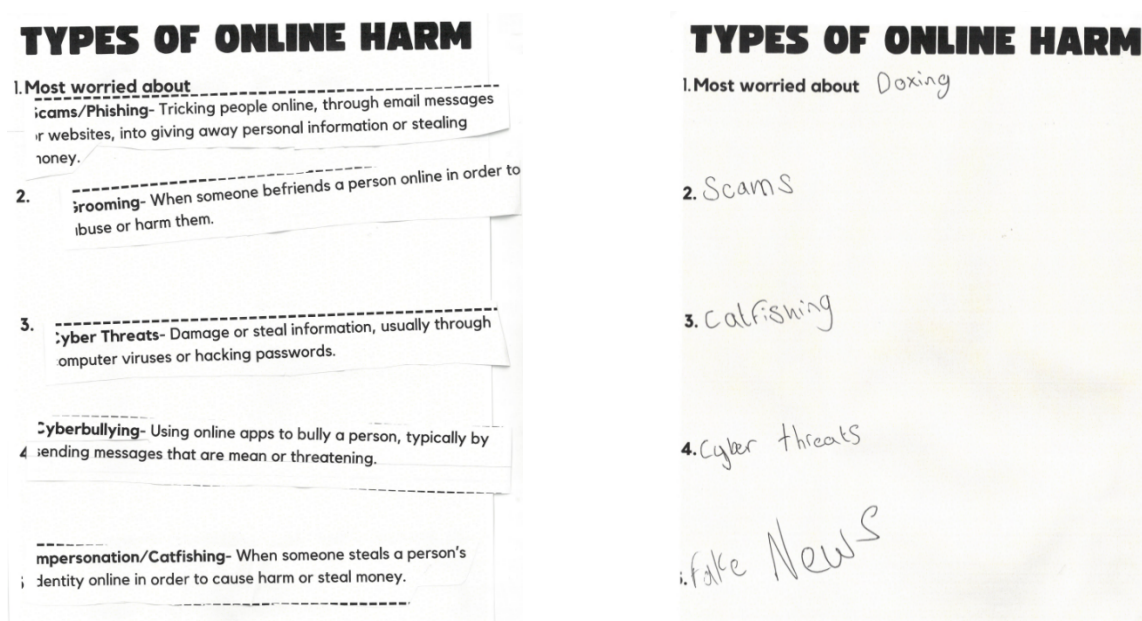


Figure 6: Examples of rankings produced by different young people from two separate schools during workshop one. They could either use cut-outs to stick onto paper (left) or write the online harms on the page themselves (right).

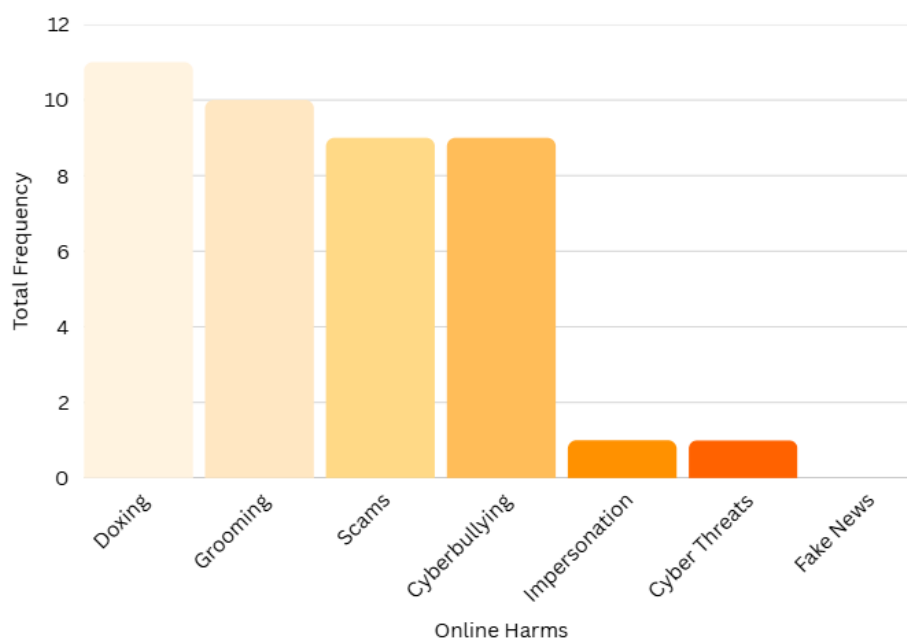


Figure 7: Total frequency of online harms recorded as No.1 in participants' ranking list.

5.3 Are young people's experiences online linked to their neurodivergence?

Across the workshops, young people rarely explicitly attributed their online experiences to neurodivergence. The open-ended activities focused on practical internet experiences rather than diagnostic reflection, and the group format may also have influenced what participants chose to discuss. We therefore report parents' responses as a separate perspective. These accounts may reflect observed incidents, parental concern, limited visibility into young people's online activities, or wider assumptions about neurodivergence; they are not treated as more accurate than young people's own accounts.

When asked directly whether their child's neurodivergence impacted their online safety, most parents believed it did in some way. Of the 31 parents who responded, the majority (N=25) said their child was more vulnerable to online harms, however the depth of responses varied greatly. Content analysis identified several recurring categories in parents' responses, including *Social trust and exploitation risk* (N=9); *Misunderstanding and communication difficulties* (N=8); *Digital literacy and knowledge* (N=6) and finally *Self-regulation, impulsivity and addiction* (N=2).

Some parents described their children as particularly vulnerable to deception or manipulation, for example, one wrote:

"[Child 1] can be very naïve and not understand the behavior of others. He is easily tricked/misled. Recent example- managed to get into a chat on Roblox with people he doesn't know. He was told that if he gave the person items they would give him one he wanted in return. He gave his then wasn't given the item from the person. Couldn't understand why the person hadn't done what they said they would. Very vulnerable."

Others discussed difficulties understanding online norms, privacy and appropriate communications:

"[Child 2's] MLD impacts him due to him misunderstanding information, not processing information, not understanding social cues. Thinks makes [Child 2] vulnerable to scams, bullying and exploitation. [Child 2] will not see danger in speaking to someone he does not know, especially if it was to do with a topic he liked."

Some parents detailed how their children's difficulties online were due to a lack of understanding and knowledge of the internet:

"Has no understanding how to use chats safely, often ending up in arguments. Talks to people she doesn't know on socials, including adults. Doesn't know where videos go when posted, or what's appropriate. Thinks you can order without paying."

Other parents detailed their children's difficulties with impulsivity and over consumption:

"Sometimes yes as the concentration isn't always there & impulses or quick actions by herself or friends mean accessing something without careful consideration of what they are looking at."

However, not all parents thought their children were more vulnerable online. Four parents believed their children did not have any increased vulnerability, and two parents thought their child's neurodivergence acted as a protective factor.

For example, one parent described how their child's focused interests were protective:

"I believe it makes him more cautious, because he does not necessarily have the same interests as other children his age, he tends to look at the world with suspicion, and he is aware of the sites he must not frequent. I believe his lack of teen interests keeps him safe online. He would rather be outside than in front of a screen."

While similarly, another felt these focused interests helped develop greater critical thinking and independence:

"Yes, he has a specialist interest in world war 2 which means I have to turn off parental guidance/parent lock for him to research and write war essays, he wants to write factual books about the history of certain battles, so I monitor quite closely but have 3 children and work. He is very sensible, grown up and don't believe things he sees and likes to question things which is great when thinking about Internet safety."

Table 2: A table summarizing the quantitative findings for RQ1.

Research Question	Quantitative Measure	Findings
RQ1) How do neurodivergent young people perceive the benefits and harms of their everyday online activities?	Platform Use	YouTube (49/57), Roblox (41/57) and TikTok (32/57) were the most used platforms; parents reported similar (YouTube, Roblox, Minecraft).
	Ranking Activity	Scams received the highest score after reverse scoring (N=144); doxing was most frequently ranked as the greatest individual worry (N=11).
	Parent Perceptions	Most parents (25/31) believed their child's neurodivergence increased their vulnerability online.

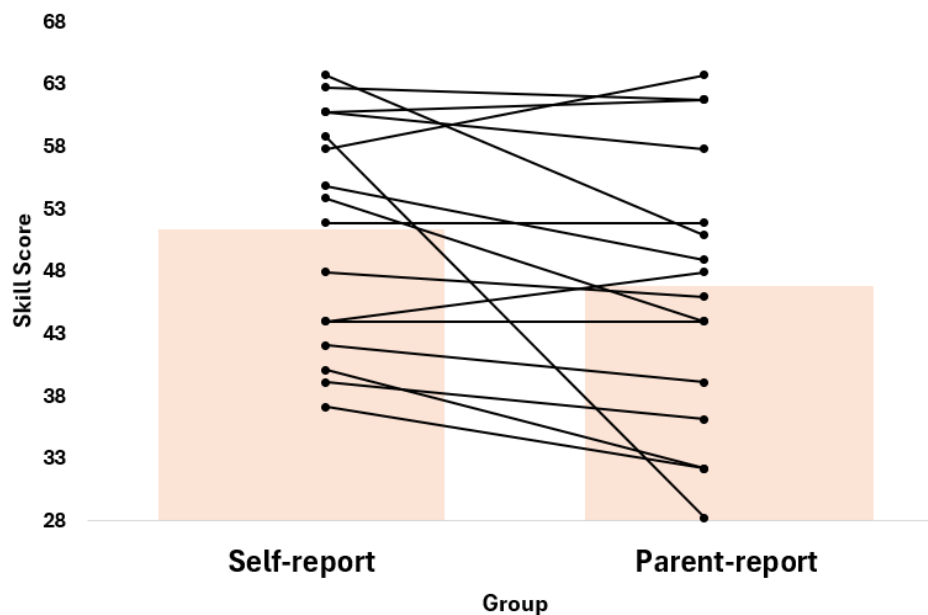


Figure 8: Average young person self-report scores and the parent-report digital skills scores (bars). Lines show individual participant data points.

5.4 What knowledge and skills do they demonstrate in relation to key online safety domains, including sharing personal information, privacy/security, and scams? (RQ2)

Next, we examined young people's digital skills and compared these with parental ratings. Only 16 young people and 16 parents were included in the skill question analysis; this was due to missing or incomplete paired data sets. A paired samples t-test suggested the children's self-reported digital skills scores were significantly higher than the scores reported by their parents, $t(15)=2.163$, $p = .047$, $d=.54$ (see Figure 8). A further analysis was conducted to assess the inter-rater reliability using a two-way mixed effects ICC with absolute agreement. The ICC estimate was .61 with a 95% confidence interval of [.188, .844], $F(15,15) = 4.86$, $p = .002$, indicating moderate reliability.

Parents also self-reported their own digital skill level, only 18 pairs of matched parent and child data were used for analysis due to missing or incomplete paired data sets. A regression analysis was performed to determine if parental skill level could predict child skill level. A simple linear regression found parent skill level did not significantly predict child skill level, $F(1,16) = .246$, $p = .627$, with an R^2 of .015.

While the ratings provided useful insights into perceived digital skills, we also wanted to understand the nature of young people's knowledge and how they interpret online information in practice. To explore this, we included two activities in the workshops: a privacy policy review in workshop three, where participants identified unfamiliar terms and suggested ways the content could be made

more accessible, and a scenario-based discussion in workshop four, where they reflected on how they might respond to common online situations.

In the privacy policy activity, young people highlighted 121 different words or phrases (see Figure 9) they did not understand. Examples of frequently highlighted terms included 'Information' ($N=29$), 'Content' ($N=26$), and 'Personalization' ($N=22$).

All of these terms largely fall into two categories: *User safety/data protection* ($N=55$) and *Platform features/technology* ($N=56$). A small number of terms ($N=10$) did not fall into these categories; these consisted of words unrelated to internet safety that the young people highlighted such as 'Barista' and 'Example'.

User safety/data protection includes any terms highlighted that relate to protecting the individual user, their data or the integrity of the platform itself. Examples include 'Information', 'Consent', 'Metadata', 'Demographic', 'Security', 'Safeguard', 'Fraud' and 'Violations'. Young people highlighting these words suggests limited understanding of what data platforms collect about its users and highlight that neurodivergent young people have limited awareness and understanding of the safety features used by platforms to protect users. *Platform Features/Technology* focuses on the platform's capabilities, features and the technology behind the platform that powers them. Examples include 'Content', 'Spotlight', 'Experience', 'Algorithm', 'Software', 'Operating System', 'Cookies' and 'Features'. The difficulty with words in this category suggests young people struggle to understand the different aspects available on each platform and have very limited knowledge of how platforms operate.

In addition to vocabulary, during the activity many participants disengaged with the privacy policies after reading only the first



Figure 9: Word cloud showing all 121 terms highlighted by neurodivergent young people as words they did not know the meaning of. The bigger the word appears, the more times the word was highlighted by young people as part of the activity.

paragraph or two. Several participants mentioned the overall length and density of the text, with comments such as “*This text is too long*” (N=11) as well as how the readability “*text needs to be bigger*” (N=1). This indicates that cognitive load of the document can also hinder readability. This task suggests that privacy policies may be inaccessible because the language and structures of the documents assume technical literacy beyond that possessed by this demographic and raises questions about the extent to which they can meaningfully consent. Other formats (e.g. video-based privacy

policies) were also presented to the young people as part of this activity and young people often preferred these to written formats, reporting that they were easier to understand.

In the scenario activity, young people initially wrote down their responses individually before participating in a group discussion. An example scenario was “Someone you met in an online game wants to be your friend on social media. They start asking for photos and want to meet up in real life”. Across scenarios, there

Table 3: A table summarizing the quantitative findings of RQ2.

Research Question	Quantitative Measure	Findings
RQ2) What knowledge and skills do they demonstrate in relation to key online safety domains, including sharing personal information, privacy/security, and scams?	Digital Skills	Young people rated their digital skills significantly higher than parents ($t(15)=2.16, p=.047, d=0.54$).
	Parent-child Agreement	Moderate agreement between ratings ($ICC=.61, 95\% CI [.19, .84]$).
	Parent-child Digital Skill Alignment	No statistically detectable association was found between parents and child digital scores ($R^2=.015, p=.627$).
	Privacy Policy Activity	Participants identified 121 unfamiliar terms, primarily related to data protection (N=55) and platform functionality (N=56).
	Scenario Activity	Most responses involved refusing requests (N=89), blocking users (N=41) or seeking support from an adult (N=20).

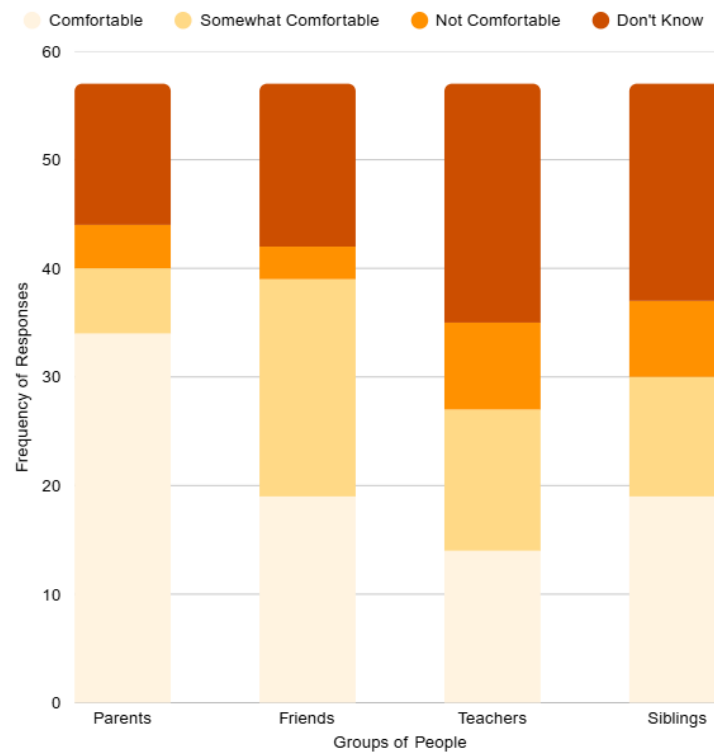


Figure 10: Graph showing young people's comfortability with different groups of individuals.

were a range of different responses ranging from active disengagement, “Say no” (N=89) or “Block them” (N=41), to adult intervention, “Tell an adult” (N=20). These responses indicate differing levels of perceived personal agency- how willing the young person was to handle the situation themselves without adult intervention. However, most of these responses reflect some familiarity with normative internet safety messaging. Some responses reflected personal characteristics rather than more strategic safety responses, for example: “I would say no because I am shy”. While less strategic, these responses may indicate a level of risk-aversiveness. Even less serious answers, such as “Tell them I am busy” or “Go away”, nevertheless implied recognition that the scenario was potentially unsafe. The young people were keen to express their differing viewpoints on what they considered to be safe and unsafe responses to the scenarios. After group feedback on each scenario, there was a group discussion about how they might respond and what the best response may be with the young people largely agreeing on disengagement actions. It was discussed among the young people and the researcher that there was no right, or wrong approach and safe practices could look different to different people.

5.5 What sources of support influence their online safety experiences? (RQ3)

To understand where young people felt able to seek support, participants rated their comfort talking about online safety or negatives

experiences with parents/carers, friends, school staff/teachers, and siblings. Young people reported they would be most comfortable talking to their parents and least comfortable talking to teachers (Figure 10). Young people also reported having the following parental controls on their devices; Anti-Virus Software (N=16), Filters or Blocks on certain websites (N=10) and Time-limits on screen time (N=9). Some young people also reported that their parents helped to set-up accounts and played a very active role in mediating online experiences:

“My dad and mum, all the settings and things, so the security part, they do it for me”

While other young people described their parents as being indifferent to their online experiences:

“I’m allowed to play anything, my parents wouldn’t even care if I played GTA, they couldn’t care less”

Across the workshops, young people were invited to reflect on the topics covered and to suggest how online safety support could be improved. For example, following the sharing information activity in the second workshop, participants were asked: “What possible ways or ideas would make knowing what to share online easier?” Similar to earlier discussions about how neurodivergence influenced their online experiences, young people offered relatively few suggestions for additional support. However, one common suggestion was that online safety education should begin at a younger age, including in primary/elementary school.

Table 4: A table summarizing the quantitative findings of RQ3.

Research Question	Quantitative Measure	Findings
RQ3) What sources of support influence their online safety experiences?	Comfortability Parental Controls	Parents were rated as the preferred source of support for online safety; teachers were the least preferred. Anti-virus software (N=16) was the most reported parental control, followed by website filters (N=10), and screen-time limits (N=9).

5.6 Integration of Findings to Inform the Framework

Table 5 presents an integrative synthesis of the mixed-methods findings from across the workshops and the parent and young people questionnaires. By examining where the qualitative and quantitative converged, diverged, and complemented each other, we were able to identify how neurodivergent young people's experiences online were influenced by the interaction between their individual characteristics, relational supports, proximal environments, and wider factors such as platform affordances. This synthesis then informed the development of a conceptual framework, presented in section 6.1.

6 Discussion

This study explored the online experiences of neurodivergent young people aged 11-13 and factors related to risk and resilience. Across qualitative and quantitative findings, three central patterns emerged. First, online experiences were rarely uniformly positive or negative; the same platforms could be sources of connection, joy, learning, or harm. Second, perceived digital competence did not always align with knowledge and understanding, particularly where platform design or legal language created accessibility barriers. Third, online safety was a factor of interconnected systems – including parents, schools, peer cultures, and platform affordances – and these interacted with individual characteristics associated with the young person. In this section, we discuss these findings firstly in terms of a conceptual framework for understanding the various influences on young people's online activity as well as in relation to previous literature, and consider potential implications for education and platform design.

6.1 A Conceptual Framework of Neurodivergent Young People's Online Experiences

Figure 11 presents a conceptual framework that synthesizes both the qualitative and quantitative findings of the study alongside previous literature. It positions the neurodivergent young person within a set of interacting influences. It highlights how the online experiences of participants within our study arise through interactions between individual characteristics, immediate social contexts (e.g., parents, schools, peers) and platform related factors (e.g., design and accessibility). The framework was developed through an iterative process of integrating qualitative and quantitative findings from the present study with relevant research and follows previous works [42] which have used Bronfenbrenner's model [8] to explain online experiences.

6.2 Individual

At the individual level, the framework highlights the characteristics associated with the young person that influence both engagement with online environments and responses to potential risk. These characteristics functioned as both protective and risk factors. Protective factors that neurodivergent young people's parents identified were focused and dedicated interests and different social expectations. Parents felt this allowed their child to navigate the internet more safely than their non-neurodivergent peers as they were less likely to come across harmful or inappropriate material. For example, some participants had interests in historical events or bus timetables (e.g., *"I use other websites like bustimes.org"*). This is supported by past research [52] which found that while neurodivergent children shared their peer's interest in football, they were more drawn to memorizing player statistics and match scores than to playing the sport. However, other parents also identified some risk factors for their neurodivergent children, including a lack of awareness of how to navigate online experiences, such as social interactions. Previous research supports this idea, Page et al. [41] found that neurodivergent young people often perceive online interactions differently to their non-neurodivergent peers.

Our findings also suggested a distinction between perceived digital competence and understanding and behaviors in real world contexts. Although many participants reported relatively high confidence in their digital skills, we found in the workshop activities that young people faced challenges in interpreting safety-related information (e.g., privacy policies) and applying safety strategies in real world contexts.

6.3 Microsystem

The microsystem captures the neurodivergent young person's immediate environments and direct relationships, such as school, parents, and friends. These influences played distinct but interconnected roles in mediating how young people interact online. Schools were the primary source of formal online safety education; however, many young people expressed a desire for earlier and more comprehensive education around online safety. For some, school-based digital education was the only source of formal guidance they had received for topics surrounding online harms, such as scams or cyberbullying. Digital education can vary considerably across schools. In settings where technology is limited, teachers may have less preparation, and young people may develop weaker digital skills, potentially increasing their exposure to online harms [53]. In our study, teachers were also rated as the least comfortable sources of support, indicating a potential gap between sources of education and help-seeking. Parents were consistently identified

Table 5: A table presenting both qualitative and quantitative findings for each research question, how they converge/diverge, and their contribution to the conceptual framework.

Research Question	Qualitative Findings	Quantitative Findings	Synthesis & Integration	Contribution to the Framework
RQ1) How do neurodivergent young people perceive the benefits and harms of their everyday online activities?	Workshop collages identified three themes around the positives and negatives online: - 'A Social Space' - 'A Personal Space' - 'A Risky Space' Participants commented on the accessibility and design of certain social media as well as current trends and popular apps/games.	Participants ranked doxing and scams as their biggest online concerns. Young people reported using the following apps: YouTube (N=49), Roblox (N=41), and TikTok (N=32). While their parents reported that they used; YouTube (N=33), Roblox (N=25) and Minecraft (N=24).	Convergence: Both data sets indicate online harms as central to neurodivergent young people's online experiences, alongside benefits (connection, entertainment, learning, etc). Complementary: Collages show the same platforms can be positive or negative, while ranking task clarifies which harms are potentially most important (e.g. doxing/scams). Synthesis: Concerns reflect both lived experiences (scams) and anticipatory risk (doxing).	Results used to construct the Outcome Level (usage domains and positive/negative effects). Clarified that online harms are not different from use but embedded in routine platforms/activities. Informed the framework, determining outcomes as co-occurring benefits and risks.
RQ2) What knowledge and skills do they demonstrate in relation to key online safety domains, including sharing personal information, privacy/security, and scams?	Workshop discussions showed awareness of unsafe situations but also accounts of prior harm (including scams). Scenario discussions included a mix of self-managed and seeking adult intervention. Privacy policy activity highlighted confusion and frustration with technical/legal language and document length.	Participants most commonly responded to online safety scenarios with 'say no' (N=89), block them' (N=41) and 'tell an adult (N=20). Privacy policy terms not understood included: 'Information' (N=29), 'Content' (N=26), and 'Personalisation' (N=22). The results indicated children's self-reported digital skills scores (M= 51, SD= 9.31) were significantly higher than the scores reported by their parents (M= 47, SD= 11.31).	Divergence: Participants report high competence, give 'normatively' correct answers to scenarios, and score highly on digital skills questionnaires, yet provide anecdotal accounts of exposure to real-world harms and gaps in understanding. Synthesis: This suggests a distinction between declarative safety knowledge (knowing what you 'should' do) and applied safety (recognising and managing risk in context), particularly where risks are social or embedded in platform design. Privacy policy findings indicate 'consent' is limited by accessibility.	Results helped to inform the Individual Level of the framework (risk and protective factors of focused specialised interests and 'social naivety'). Also strengthened the framework pathways linking Platform affordances/accessibility .
RQ3) What sources of support influence their online safety experiences?	Young people described parents helping with accounts/security and often discussed school as a key source of safety information. Reflection tasks resulted in few concrete suggestions, though some requested earlier education (primary school).	Young people reported feeling most comfortable talking to their parents and least comfortable talking to teachers about online harms. Young people also reported having parental controls on their devices including Anti-virus software (N=16), Filters or Blocks (N=10), and Time-limits (N=9).	Divergence: Schools appear important for delivering safety knowledge, but young feel least comfortable seeking help from teachers, indicating a disconnect between formal education and comfort in discussion. Convergence: Parents/caregivers are consistency the group who are central for support across the data sources (comfort, supervision, practical set-up). Synthesis: Safety support is distributed across different contexts. Interventions could target building comfort within school settings or improving parental knowledge of online safety practices.	Results helped to inform the Microsystem Level , by differentiating the role of parents, school and peers and identifying the importance of support pathways. Highlights microsystem influences operate differently, with parents positioned as primary support figures despite schools providing formal safety education. The results also support the Mesosystem connections within the framework (e.g. how peer-school dynamic influence online safety indirectly).

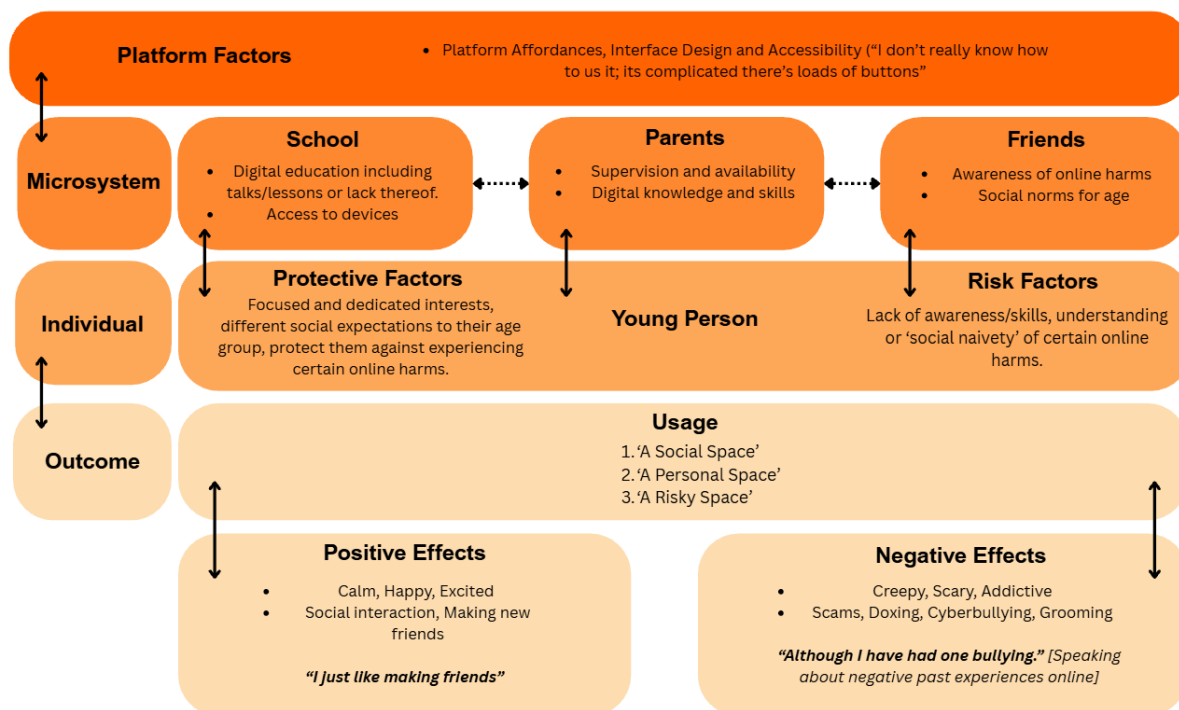


Figure 11: An integrative framework that synthesizes the qualitative and quantitative findings of the present study.

those who the young people were most comfortable talking to about online harms, however, young people also described varying degrees of parental involvement, ranging from active engagement and monitoring to perceived indifference. In addition to emotional support, parents played a practical role in mediating online experiences, including managing account set-ups and security features. Previous research has shown that parental involvement in non-neurodivergent young people is crucial to decrease 'risky' online behaviors [54] however, research also has shown that restricting children's internet use does not better protect them against online harms unless they do not spend any time online [53].

Although peers were less explicitly discussed, references to "trends" on social media and popular platforms indicate that peer norms influence platform engagement indirectly. These peer influences will determine the types of applications young people engage with and will therefore impact on the types of online harm they are exposed to, consistent with recent research highlighting the role of peer pressure in the increase in viral online 'challenges' [48].

6.4 Platform Factors

Platform factors refer to aspects of digital environments that influence how young people interact with online spaces, including interface design, accessibility, information presentation, and consent protocols. Across the workshops, young people commented on platforms affordances, design, and accessibility of the applications they were using, particularly when they were difficult to access or created barriers to engagement. For example, some designs were

deemed too 'complicated'. Some platforms required parents or caregivers to manage account set-up and security features (e.g., "my dad and mum, all the setting and things so the security part, they do it for me").

Accessibility of safety-related information also emerged as a key issue. In the privacy policy activity, young people frequently identified unfamiliar terminology and reported disengaging from long or complicated policy documents. This suggests that information essential for consent is not always presented in accessible formats. For example, interactions within games or social platforms created opportunities for scams. Although participants demonstrated awareness of safety strategies (e.g., blocking or ignoring users), applying these strategies in real-life contexts may be more challenging.

6.5 Outcomes

The outcomes level represents the different forms of online engagement and experiences that emerge from the levels above. Rather than uniformly positive or negative, these outcomes were often described by young people as overlapping, with experiences dependent on context. Similar online activities (e.g., social media, gaming, or information seeking) were associated with both beneficial and adverse experiences. For instance, the internet as 'A Social Space' was associated with positive experiences of connecting with friends and family, but also negative experiences of cyberbullying. This suggests that outcomes are not inherent to specific platforms or behaviors but co-occur within the same digital environments. Rather than focusing on restricting access to particular platforms, this

highlights the need to consider how negative experiences might be mitigated while preserving the benefits young people derive from online engagement.

6.6 Differing Harms and Protective Factors

Our study highlighted that the online harms discussed by neurodivergent participants differed from those documented in research with predominantly non-neurodivergent samples, albeit many of these studies were conducted with wider ages ranges limiting direct comparison. A report by the Youth Endowment Fund [57], which commissioned a survey of over 10,000 young people aged 13-17, found that 70% of young people had seen graphic content including real-life violence online in the past year. Of those exposed, 80% said it made them feel less safe in their local communities and 68% said it made them feel less likely to go out. While participants in this study did discuss graphic content, it did not explicitly feature in their top ranked online harms. One possible explanation is that younger participants may have been reluctant to disclose exposure to content they recognized as age inappropriate. While some participants may not have been aware of, or may have underestimated, the potential harms associated with such content, harm is a subjective experience, and individual differences in sensitivity to graphic content may also have shaped participants' perceptions. It is also possible that as pre-determined categories of online harm were presented to the young people as part of the activity, concerns such as doxing and scams did not necessarily reflect actual incidence or vulnerability, and future research should explore the concerns of neurodivergent young people further. In addition, research has shown fake news is of growing concern particularly among young people [29]. However, fake news was the only online harm in the present study that no participants rated as their top concern. Again, possible explanations for this may be the young age of the participants or a lack of wider knowledge about certain online harms. One study by Zozaya-Durazo et al. [62] found young people were excessively confident in their ability to identify fake news, and this might also explain why they did not view fake news as more concerning.

However, in addition to the potential for differing vulnerability or concern for online harms for neurodivergent youth, neurodivergent young people in this study, and some parents, also discussed the idea that their neurodivergence acted as a protective factor. This is centered on the idea that by exploring the internet in perhaps different ways to their non-neurodivergent peers, they may be at less risk to certain online harms. For example, some young people taking part in the study did not use the internet for socializing at all and had no social media or gaming accounts. For them, the internet was a place for learning, and most of their time online was spent looking for information around their interests e.g. buses, history, animals. This might have 'protected' them from online harms such as cyberbullying, grooming and catfishing, if they were not as exposed to them as their peers. Previous research by Bannon et al. [3], showed that the use of the internet by young people with additional support needs was vital to the young person developing a sense of identity, competence and social connectedness that may present as a challenge for this population in offline environments. Interestingly, an online harm that is well documented in research

with non-neurodivergent youth but was not mentioned by any of our neurodivergent young people was peer pressure [56]. However, while limited engagement in social media may shield some neurodivergent young people from risks such as cyberbullying, it may simultaneously reduce opportunities for digital inclusion, peer connection, and identity exploration [38].

6.7 Skill-perception gaps between youth and parents

Young people reported higher digital skill levels than their parents attributed to them, consistent with previous research showing discrepancies between self- and proxy-reports [28]. This highlights the importance of including the voices and perspectives of neurodivergent young people. This might reflect young people's greater insight into their everyday technology use, particularly in contexts such as gaming and social media which parents do not regularly observe. It is also consistent with research suggesting that there is a degree of overprotection and underestimation of neurodivergent young people by the adults in their lives [16]. In addition, parents of young people with neurodevelopmental conditions often experience societal ableist assumptions and stigmas, which may have influenced perceptions of their child's abilities online [34].

However, our qualitative findings also potentially suggest confidence or knowledge does not always translate into applied action. While participants often gave normatively appropriate responses to safety scenarios, they also reported real-world experiences of harm and difficulty interpreting privacy information. This supports a distinction between knowing what to do and being able to apply that knowledge in context, particularly where risks are influenced by platform design or social environment. Future research should explore neurodivergent young people's abilities to apply safety strategies in real world contexts, and how best to transfer education to real life.

Contrary to expectations and prior research on parental mediation [59], parents' own skill levels were not significantly associated with their children's self-reported skill levels. This may suggest that, as we propose in our framework, young people develop digital skills, and therefore experiences, through multiple pathways (microsystems) beyond just parental influence. These include peers and school environments as well as independent exploration of online spaces. However, these results should be interpreted cautiously due to a relatively small sample size. We were also not able to control how parents completed the questionnaires, for example, their children may have been present at home when they were completed.

6.8 Implications for Education, Parents, and Accessible Technology Design

Our combined findings have potential implications for education, families, and the technology industry. Schools are the primary formal source for online safety education for many neurodivergent young people, for example all schools in England are required to teach children about online safety [24]. However, some of our participants reported wanting earlier digital education and teachers were also rated as the group they were least comfortable talking

to about online harms. Given our findings suggest potential differences in online experiences compared with previous studies with neurotypical populations, digital safety education in schools is likely to be most effective when it is adapted to reflect neurodivergent students' distinct priorities and experiences online.

Parents emerged as the most important source of support for the young people in our study, with most participants reporting they would feel most comfortable talking to their parents about online harms over their peers, siblings, or teachers. However, several parents described limited digital knowledge or an overreliance on restrictive controls, suggesting there is a need for further education and resources for parents and caregivers of neurodivergent young people. Previous research has found open, informed dialogue between young people and their parents/caregivers provides the best possible environment for healthy online practices [32].

Finally, our activities highlighted some design barriers in the digital environment, particularly the inaccessibility of privacy policies. While the sole responsibility to read privacy policies does not rest with young people, it is important to examine how neurodivergent young people engage with safety-related information, especially given that they often encounter these while navigating online spaces and caregivers are not always present to consent on their behalf. While the present study did not capture the underlying reasons for this difficulty with privacy policies (e.g., word length, complexity, unfamiliarity, or broader context). Nevertheless, this finding points to the need for more accessible approaches. Technology companies have a responsibility to present information in an accessible format that accommodates the needs of diverse users. When comparing traditional worded privacy policies to Meta's video format privacy policy, all of the young people in the workshops stated they preferred the video format and found the information easier to understand that way. Co-designing interfaces could help to make online spaces more accessible and inclusive.

We have also therefore developed brief guidelines inspired by our research findings focused on education, parents/caregivers, and technology design.

6.8.1 Education.

- **Earlier and better online safety education:** The neurodivergent young people in the study suggested digital education should occur earlier, in primary school, and be more interactive.
- **Accessible teaching methods:** Designed specifically for the needs of neurodivergent learners (e.g. visual aids, accessible backgrounds and text), which worked well in our workshops.
- **Varied topics:** Most research has focused on cyberbullying and often there is a focus on 'stranger danger' online, but our neurodivergent young people were concerned about various different online harms including doxxing, internet addiction, and scams (particularly via video games like Roblox).

6.8.2 Parents/Caregivers.

- **Trust and communication:** Neurodivergent young people reported feeling most comfortable talking to parents, suggesting this relationship is a key protective factor to leverage in supporting digital safety for neurodivergent young people.

- **Supportive mediation over strict control:** In our study, neurodivergent young people spoke of parents varying from 'not caring' to being highly restrictive; research suggests open dialogue is more effective than either extreme.
- **Parent education:** Some parents admitted to low digital knowledge. More research into evidenced based training and resources for parents, particularly tailored for those with neurodivergent children, could help them guide them more effectively.

6.8.3 Technology Design.

- **Accessible privacy and safety information:** The privacy policy activity showed neurodivergent young people could not understand key terms like 'Metadata' or 'IP address'. Development of more accessible safety and privacy information using plain language, shorter texts, visual icons and accessible formats such as videos designed for young people.
- **Proactive harm reduction:** Platforms should prioritize user autonomy and provide greater transparency about safety features and scams/spam filters that do not depend on age or digital skill level to implement.

7 Strengths, Limitations & Future Work

This study integrated a broad range of data and experiences from both young people and their parents into a conceptual framework that highlights the key influences on online safety in this under-researched population. While the framework adopts an ecological perspective, it does not aim to capture all possible influences on young people's online experiences and purely reflects the experiences of the neurodivergent young people in our study. The framework is intended as a conceptual descriptive synthesis of the present study's findings that could inspire future research, rather than a fully specified systems framework of all possible factors or a validated model.

This study sought to explore the experiences of a broader range of neurodivergent populations. Previous studies have focused on individual populations of neurodivergent individuals (focusing solely on autism or ADHD) and sometimes over-looked the large overlap in co-occurring conditions and characteristics. By utilizing workshops as our methodology, we were able to include participants with a range of abilities, creating a research environment where all neurodivergent voices were listened to too. Although our sample included young people with diverse neurodevelopmental profiles, we did not have the sample size to be able to differentiate experiences by area of neurodivergence or diagnosis. Future research should examine how specific areas of neurodivergence (e.g. ADHD vs dyslexia) intersect to shape online safety experiences.

The decision was made early to not include a comparison or control group as part of the present study, therefore no non-neurodivergent young people were recruited. This was due to the focus being on exploring and amplifying the voices and experiences of neurodivergent individuals. Much research [61] has already focused on the online experiences of non-neurodivergent individuals. However, future studies may benefit from the inclusion of non-neurodivergent individuals to draw comparisons on the experiences of online harms and to establish if these experiences are unique.

Due to the use of pre-determined categories of online harm in the ranking activity, concerns such as doxing and scams did not necessarily reflect actual incidence or vulnerability. While the young people were able to and did produce some of their own categories of harms, future research should explore the concerns of neurodivergent young people further without the use of any prompts.

Due to the age range of young people, 11–13 years, within the present study, challenges arose when conducting the workshops and subsequently in data analysis. This age range was chosen due to being a key target area for online harm prevention, as most young people start to access the internet more independently around this age range [44]. However, it was found during the workshops that the young people were not often able to provide deep introspection or detailed reflection on their experiences online. This may be due to their age, or additional learning needs. As a result, data collected about experiences and recommendations for how to improve experiences was limited. While the workshop format provided some benefits, allowing a wide range of abilities to take part in research and contribute, the format did not lend itself as greatly to in-depth discussions as one-to-one interviews might have done. Future studies may benefit from gathering the viewpoints of older neurodivergent children, or neurodivergent adults on their experiences of the internet during childhood, to allow for more in-depth responses.

As part of this study, a measure of internet usage and skill level was developed and tested for both young people and parents. This measure was both appropriate for use in neurodivergent populations but also adapted to reflect the current internet climate. This tool could be useful for studies looking to examine internet usage and skills in both neurodivergent and neurotypical children. The full questionnaires are provided in the supplementary materials.

Another area of focus for future work lies in parent-child interventions. Despite no significant correlations between the parent digital skill and child skill digital data, some parents commented on their lack of knowledge or awareness surrounding the internet and their child's internet usage. In addition, some children also commented on their parents 'not caring' what they did online. Zgambo et al. [58] found in their meta-analysis that digital safety interventions not only improved parents' digital knowledge and skills but also had a notable impact on both parents' and children's screen time, significantly reducing overall usage. This highlights a potentially key area for interventions to improve parent literacy surrounding internet use, to in turn increase computer literacy for young people.

8 Conclusion

In this paper, we have explored the experiences of neurodivergent young people and developed an integrative framework for internet use in this population. This framework describes both the individual factors as well as the wider systems that influence neurodivergent young people's internet experiences. Our contributions to this under researched area provide guidance for future researchers to support and understand the wider experiences of neurodivergent young people online and provide areas of focus to better support neurodivergent individuals in the future.

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