



# Use of Voice Assistants and Generative AI by Children and Families

Date of Release: February 2024





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## AUTHORS

<u><a href="#">David Bickham, PhD</a></u>	Research Director, The Digital Wellness Lab
<u><a href="#">Sam Schwamm, MA</a></u>	Clinical Research Specialist, The Digital Wellness Lab
<u><a href="#">Emily Izenman, BA</a></u>	Clinical Research Specialist, The Digital Wellness Lab
<u><a href="#">Zhiying (Zoey) Yue, PhD</a></u>	Post-Doctoral Research Fellow, The Digital Wellness Lab
<u><a href="#">Michael Carter, PhD</a></u>	Post-Doctoral Research Fellow, The Digital Wellness Lab
<u><a href="#">Nicole Powell, MSW</a></u>	Clinical Research Specialist, The Digital Wellness Lab
<u><a href="#">Kaitlin Tiches, MLIS</a></u>	Medical Librarian & Knowledge Manager, The Digital Wellness Lab
<u><a href="#">Michael Rich, MD, MPH</a></u>	Founder/Director, The Digital Wellness Lab

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## SPECIAL THANKS

<u><a href="#">Oluwatomilola Idowu, BSc</a></u>	Graduate Research Intern, The Digital Wellness Lab
<u><a href="#">Brinleigh Murphy-Reuter, BA</a></u>	Program Administrator, The Digital Wellness Lab



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# Introduction

## The New World of AI

Today's youth are living in a digital world that is increasingly shaped by Artificial Intelligence (AI). The youngest children have been interacting with certain forms of AI since the introduction of digital assistants like Siri, Alexa, and Google Assistant. In 2020, 41% of homes surveyed with children 0-8 years old had a smart speaker, an increase of 32% from 2017 (Rideout & Robb, 2021). Understanding how children are using these devices and technologies can help us guide them through navigating this new world of AI. In particular, examining age differences can be especially informative. As children age from preschool to middle school, they experience dramatic developmental changes including the shift to a more peer-centric social network and the emergence of more sophisticated understandings of the distinction between fantasy and reality (Woolley & Nissel, 2020). These changes likely shape both motivations for using these technologies and how they are used.

## Voice Assistants and Parasocial Relationships

Voice Assistants are virtual characters within an existing device, often with assigned names and implied genders, who respond directly to queries or tasks when the user speaks a "wake" word or phrase (ex. "Hey Siri"). Children are known to create relationships with fictional characters in other forms of media like television (Calvert & Richards, 2014). These connections, known as parasocial relationships, are one-way emotional attachments between a viewer or user and a media character or artificially intelligent technology (Horton & Wohl, 1956) and have been shown to support more positive outcomes in learning tasks with a preferred character (e.g. Howard Gola et al., 2013; Lauricella et al., 2011). Recent work has found that similar relationships may occur with Voice Assistants like Alexa, with children often ascribing human-like qualities to these Voice Assistants, such as reporting that the Voice Assistant can be a friend or is smart (Girourad-Hallam et al., 2021; Hoffman et al., 2021; Xu & Warschauer, 2020).

In previous research, the level of social and emotional qualities children attribute to Voice Assistants is moderated by age, with younger children more frequently believing the Voice Assistant is human or reporting that they would want to spend time with the device if they were lonely (ex. Andries & Robertson, 2023; Girourad-Hallam et al., 2021; Xu & Warschauer, 2020). As children get older, their focus when interacting with Voice Assistants may shift to attempts to understand the device and test the Voice Assistant's intelligence (Garg & Sengupta, 2020). Existing research has demonstrated that children are often using these virtual assistants for learning (e.g., Lovato et al., 2019) and that there may be educational benefits to using Voice Assistants (Xu et al. 2021, 2022); less is known about how parasocial relationships will moderate learning. Investigating how the strength of parasocial relationships differs by age may help identify key points to ensure educational use of these platforms is effective for different developmental stages.

### Family Use of Voice Assistants

In terms of broader family dynamics, Voice Assistants also provide opportunities for parents to have family management tools available to them with very little effort; timers, calendars, announcements and other similar functionalities may help parents coordinate the complex child and parent obligations common among today's busy families. However, having technology present and so easily accessible, could potentially interfere with family interactions, as evidenced by research showing that the presence of cell phones reduces parent/child interactions and other social exchanges (Radesky et al., 2014, 2016; Vanden Abeele et al., 2020). Finally, the presence of Voice Assistants in common spaces and for co-use among family members could lead to disagreements as negotiations occur for access or preferences, like family members vying for music choices, which causes disruption to the device (Beirl et al., 2019; Beneteau et al., 2020). The functionality of these devices, on the other hand, may provide tools for managing and reducing family conflict as parents integrate the Voice Assistants into their own parenting practices, or are used as a neutral mediator to solve disagreements (Beneteau et al., 2020; Wang et al., 2023). Across all of these issues, families likely use these devices differently depending on the age(s) of their child(ren).

### Parental Perceptions and Beliefs

Parental beliefs about, and exposure to, technology shape the access they provide their children and the ways that media are used in the family. For example, because adults perceive newer technologies that they did not grow up with as more threatening to the current generation (Protzko & Schooler, 2023), they may be less likely to make them available to their children. Although Voice Assistants are a modern form of technology, they may side-step many parental concerns about new media: they can operate without screens, do not typically encourage interaction with strangers, and do not manipulate attention through push notifications. Other parental concerns, however, have been identified, including fears that Voice Assistants may compromise safety or privacy, or interfere with parent/child relationships (Fu et al., 2022; Garg & Sengupta, 2020; Sun et al., 2021).

While there is some evidence that parents believe that Voice Assistants can enhance social emotional learning, including encouraging politeness and fostering support among siblings, they also express fears that a Voice Assistant may displace face-to-face social-emotional learning opportunities or teach their child values misaligned with their own (Fu et al., 2022). These assistants can also provide educational experience to young users, including providing factual information, answering burning questions, and presenting educational quizzes and games. These curiosity-driven searches for factual information are frequently how children use the device (Lovato et al., 2019). Parents who believe that Voice Assistants can have a positive impact on their child's academic success and creative abilities may be more open to providing the technology and encouraging its use in productive ways; on the other hand, parents who see these devices as intrusive or unnerving would likely limit their child's use. Understanding parents' beliefs about how digital assistants can impact the development of their child will help inform the design of these platforms as sources of educational and prosocial content.

### **The Rise of Generative AI**

Until recently, children and family’s interactions with AI were primarily limited to the Voice Assistants described above; however, Generative AI has now entered the arena of children’s technology, presenting almost limitless potential to transform children’s learning and development. Despite the rapid adoption of this new technology, we still know very little about how parents and children feel about Generative AI or how they are using it. The almost magical quality of platforms like ChatGPT to produce novel content is obviously a tool that can assist with educational and creative pursuits, but it could also interfere with these activities by substituting for human interaction. Generative AI’s ability to have conversations with users, mimic self-awareness, and be self-referential could lead to strong parasocial relationships among users or could foster feelings of unease and distrust. Parents’ beliefs about the impact of this technology and their own usage will likely dictate their children’s access to these platforms and their attitudes as they integrate these tools into their daily lives.

## INTRODUCTION

### Research Questions

For this survey, we asked parents\* of children ages 3 to 12 about emerging trends related to the use of Voice Assistants by families, including how they are used within the household, children and parents' relationships with these assistants, and their perceived impact on children's learning and development. We also asked about their experience with and attitudes about Generative AI.

1. **How are children accessing Voice Assistants, how often are they using them, and what are they using them for?**
  - a. How do these questions vary by age group (3-5, 6-9, 10-12 years old)?
2. **What type of relationship(s) do children have with Voice Assistants? How do they treat them and interact with them?**
  - a. How does this differ by age group?
3. **How are families using Voice Assistants, and what functions do they serve in the home? Are parents using them to help manage their families, and if so, how?**
4. **What risks and opportunities do parents see in Voice Assistants?**
  - a. Do they see them as potential learning tools?
  - b. Do Voice Assistants provide opportunities for connecting with other people?
  - c. Do they feel at ease or uneasy about the behaviors and functions of Voice Assistants?
  - d. How do these beliefs differ by the age of their child?
5. **How often do parents and children access Generative AI, and what do they use it for?**
  - a. Do parents see Generative AI as a threat or an opportunity to their child's future learning and development?
  - b. Do parents feel at ease or uneasy about the behaviors and functions of Generative AI?

### How We Conducted This Survey

A nationwide sample of 1,447 parents of children ages 3 to 12 were surveyed between December 18, 2023 and January 3, 2024 using the Alchemer online research platform. Participants were required to have at least one child between the ages of 3 to 12 who actively uses a digital Voice Assistant (e.g., Siri, Alexa, Google Assistant) on any device; parents with more than one child between the ages of 3 to 12 were instructed to answer about the child who interacts with AI Voice Assistants most frequently.

A full description of the methods can be found at the end of this document.

*\*In this report, we use the term "parents" to refer to all parental figure caregivers.*

### How to Use These Findings

This report provides detailed insights into how children and families use Voice Assistants and Generative AI tools in the household, as well as parents' perspectives on how these technologies influence their children's learning and development. To address the wide variety of contexts in which AI-powered assistants are used, we looked closely at specific Voice Assistants (e.g., Alexa, Siri, Google Assistant) and devices (e.g. smartphone, tablet, smart speaker), how often they are used to perform different tasks, parents' and children's attitudes towards these tools, and importantly, age-related differences in all of the above. While these findings paint a generally positive picture of how children and parents have embraced AI-powered tools for entertainment, education, creative pursuits, and family bonding, they also raise potential issues around privacy, safety, advertising, and digital literacy that merit careful consideration and further investigation.

For tech industry professionals looking to integrate AI into their products and services, the results of this survey indicate that many parents are open to using voice assistants and Generative AI to enhance their family dynamics as well as their children's education, curiosity, creativity, and leisure activities. However, they also highlight some gaps in how different types of families may view these technologies and their impact on children, which will likely need to be addressed through intentional design and education of both parents and children on the benefits and limitations of these technologies. See Tech Industry Recommendations for more insights (<https://digitalwellnesslab.org/reports/recommendations-for-industry-use-of-voice-assistants-and-generative-ai-by-children-and-families/>).

For parents and caregivers, these results highlight potential areas of risk for children who are using Voice Assistants and Generative AI, but they also offer some clues as to the types of mediation strategies (e.g., rules, discussions, parental monitoring) that may help maximize the benefits of these tools for young people while protecting them against the possible downsides of these rapidly-developing technologies. In addition, the many significant differences in how children of different ages interact with Voice Assistants and Generative AI applications suggests that the most effective parenting strategies will depend on children's ages and developmental trajectories, family involvement in the setup and use of smart devices, attitudes towards these tools, and other contextual factors.



## Notes About the Findings

- We have sometimes combined responses from more detailed scales to simplified three-point scales for ease of reporting and visualization (e.g., “not at all”, “a few times a month or less”, “once a week”, “a few times a week”, “once a day, more than once a day” were consolidated to “not at all”, “a few times a week or less”, “once a day or more”).
- Mean differences by age were calculated for questions that used the full range of five-point or six-point scales. The age groups we utilized were 3-5 years, 6-9 years, and 10-12 years, which were chosen to align with key developmental stages in early/middle childhood and early adolescence.
- Throughout this report, we use the language “parents of children ages \_\_” to describe parents responding about a child within this age group; participants may have children of other ages who also use Voice Assistants, but they were instructed to focus their responses on the child who uses them most frequently.
- Relationships were tested using ANOVAs to compare means by age-groups when 5- or 6-point scales were used. Chi-Square tests were used with categorical variables. When applicable, statistically significant relationships are indicated with an asterisk (\*) and/or the term “significant(ly)”. Differences were considered statistically significant at  $p < 0.05$  (i.e. 95% confidence that they are not due to random chance).



# KEY FINDINGS



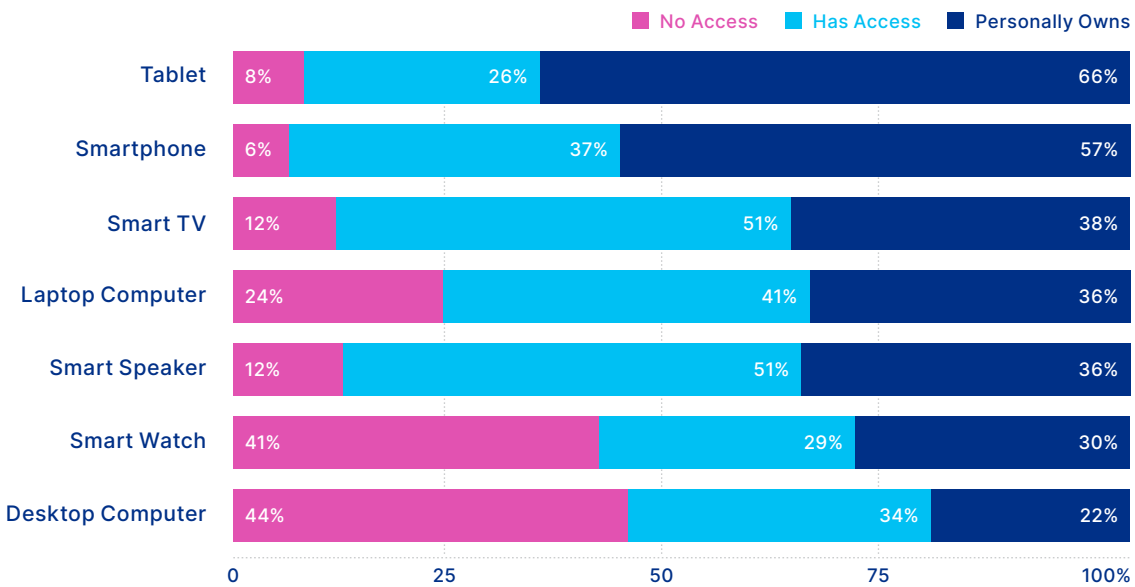
# Children’s Interactions with Voice Assistants: Access and Use

## Device Ownership and Access Among Children

When asked about their children’s ownership of and access to different devices that are commonly used to interact with Voice Assistants, a considerable portion of parents reported that their children either own and/or have access to a smartphone (94%), tablet (92%), or smart speaker (88%); comparatively, fewer children own or have access to a smartwatch (59%). For device ownership, 66% of respondents reported that their child owns a tablet, 57% a smartphone, 36% a smart speaker, and 30% a smartwatch.

### Which of the following devices does your child own or have access to?

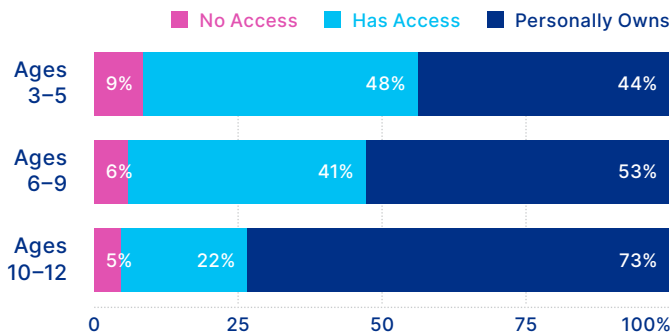
(For each device, please specify if your child owns it, has access to it but does not own it, or does not have access. Remember to think about the child who is between the ages of 3-12 and uses Voice Assistants.)



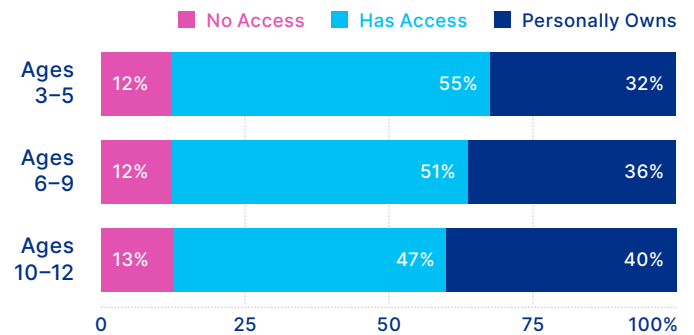
## KEY FINDINGS

Overall, access and ownership of smartphones was higher in the older age groups. For example, 73% of 10-12-year-olds owned a smartphone, compared to 53% of 6-9-year-olds and 44% of 3-5-year-olds. The pattern of ownership and access to other devices followed a similar trend, although these differences were not statistically significant. Considering smart speakers as an example, 40% of 10-12-year-olds owned one, 36% of 6-9-year-olds owned one, and 32% of 3-5-year-olds owned one.

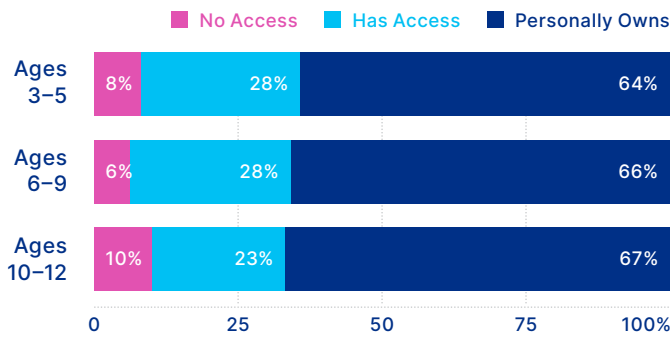
### Access to Smartphone by Age Group\*



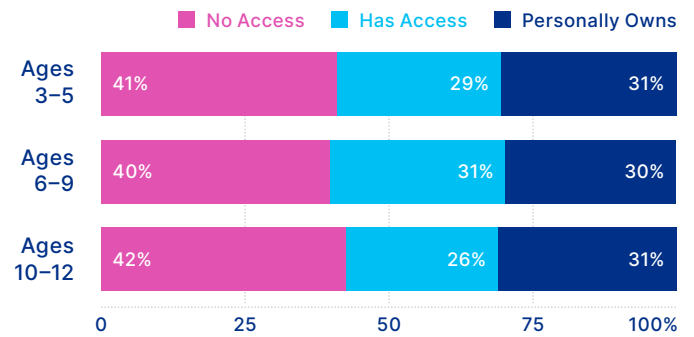
### Access to Smart Speaker by Age Group\*



### Access to Tablet by Age Group



### Access to Smartwatch by Age Group



\*When applicable, statistically significant relationships are indicated with an asterisk.

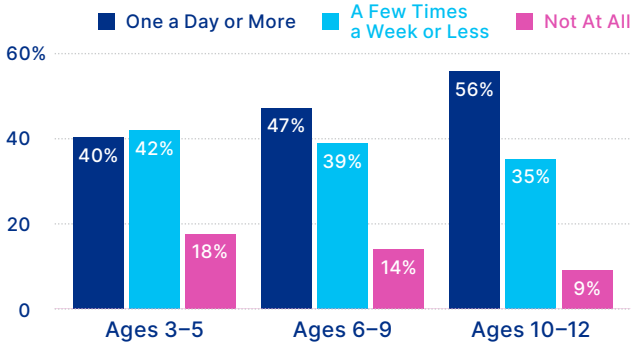
## KEY FINDINGS

### Children's Use of Voice Assistants

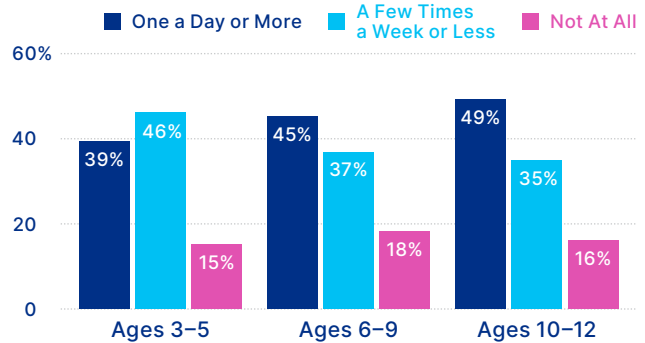
On average, parents reported that their children most often interacted with Voice Assistants using smartphones (Mean = 3.11), smart speakers (Mean = 2.99), and tablets (Mean = 2.93). Around 48% of parents reported that their children used smartphones to access Voice Assistants at least daily, closely followed by smart speakers (45%) and tablets (44%). Older children were significantly more likely to use smartphones to access Voice Assistants at least daily, moving from 40% of 3-5-year-olds to 47% of 6-9-year-olds and 56% of 10-12-year olds. A similar pattern was found for daily use of smart speakers: 39% of 3-5-year-olds, 45% of 6-9-year-olds, and 49% of 10-12-year-olds.

Over the last 30 days, how often has your child interacted with a Voice Assistant on the following devices:

Smartphone Frequency of Use by Age Group\*

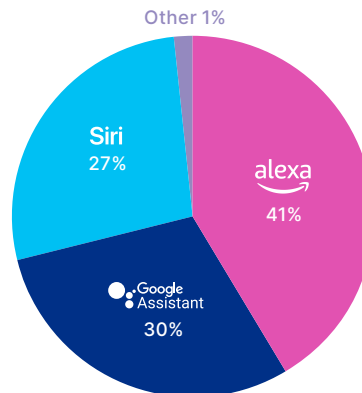


Smart Speaker Frequency of Use by Age Group



When asked about their children's use of particular Voice Assistants, 68% of parents reported that their children have interacted with Alexa, 55% with Siri, 54% with Google Assistant, and 10% with all others. In terms of the Voice Assistant used most frequently, 41% of parents selected Alexa, 30% Google Assistant, 27% Siri, and 1% chose others. The likelihood of children having ever interacted with Alexa varies by age, with a higher prevalence among older children. However, for other Voice Assistants like Siri and Google Assistant, age does not appear to be significantly associated with the likelihood of interaction.

Which Voice Assistant do you interact with the most?



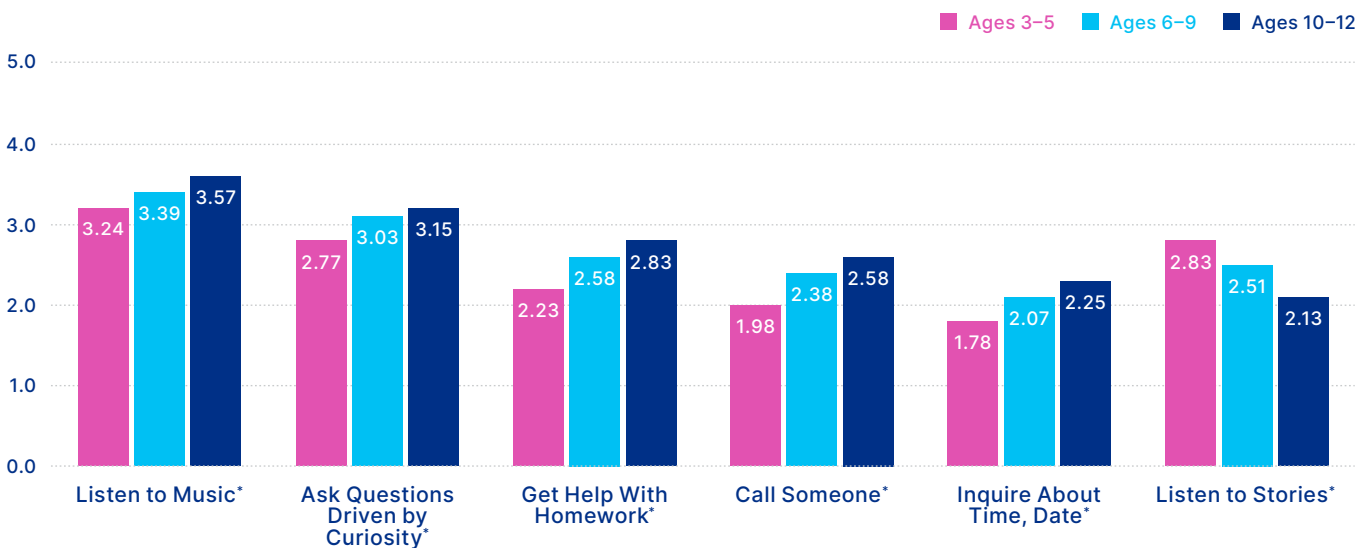
\*When applicable, statistically significant relationships are indicated with an asterisk.

## KEY FINDINGS

Finally, we asked parents how frequently their children use Voice Assistants for different tasks. Considering tasks performed at least once per day, the largest proportion of parents indicated that children were using Voice Assistants to entertain themselves (e.g., 52% listen to music, 45% playing games or taking quizzes, 34% listen to stories), support learning (40% asking questions driven by curiosity, 33% get help with homework or other educational activities), and connect with others (e.g., 32% messaging, 31% calling). Less common activities involved completing functional tasks (e.g., 28% set reminders, timers, or alarms) and seeking information (e.g., 23% seek factual information such as business hours).

There were significant variations in how children of different ages used Voice Assistants. Older children tended to use them more frequently for educational support, connecting with others, and seeking information. When using Voice Assistants for entertainment, older children listened to music more frequently, whereas younger children were more inclined to listen to stories. For other forms of entertainment, such as playing games or telling jokes and riddles, as well as for functional activities like controlling smart devices, no significant age-based differences were found.

### How frequently does your child use Voice Assistants for the following tasks?



#### SIX-POINT SCALE

0 = Not at All 1 = A Few Times a Month or Less 2 = Once a Week 3 = A Few Times a Week 4 = Once a Day 5 = More Than Once a Day

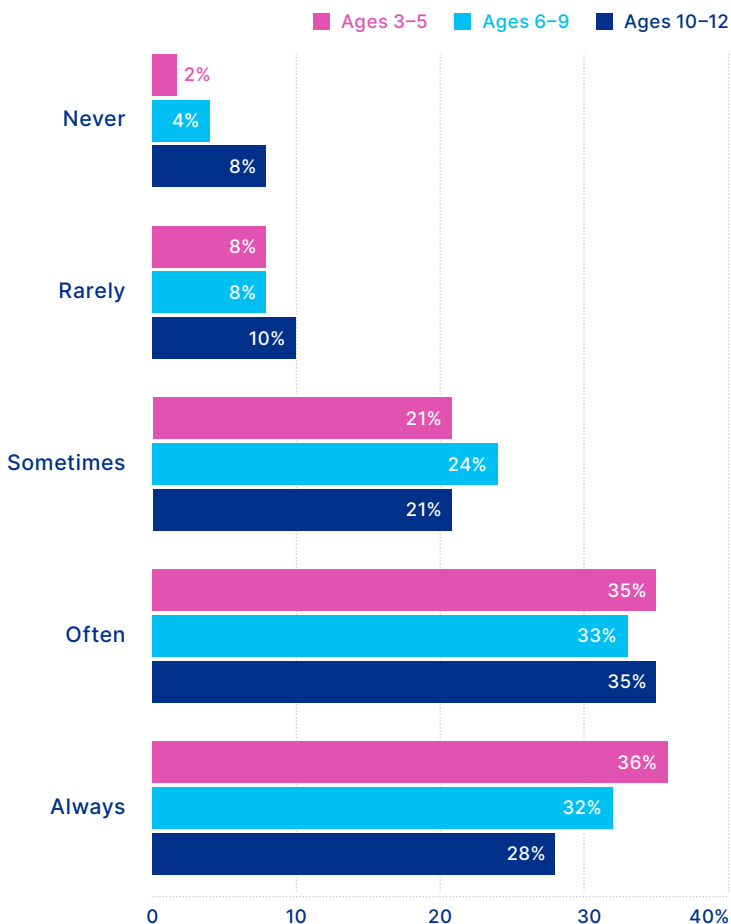
## KEY FINDINGS

### Children's Relationships with Voice Assistants

To investigate the relationships that children may form with Voice Assistants, including the social nature of their communication and interactions, we asked parents questions about their child's behaviors towards and beliefs about these assistants.

The majority (65%) of parents reported that their children say "please" or "thank you" either often or always when talking to a Voice Assistant. A significantly higher percentage of younger children used polite language compared to older children: 70% of 3-5-year olds, 65% of 6-9-year-olds, and 62% of 10-12-year-olds did so either often or always.

When talking to a Voice Assistant, how often does your child use polite language like "please" and "thank you?"



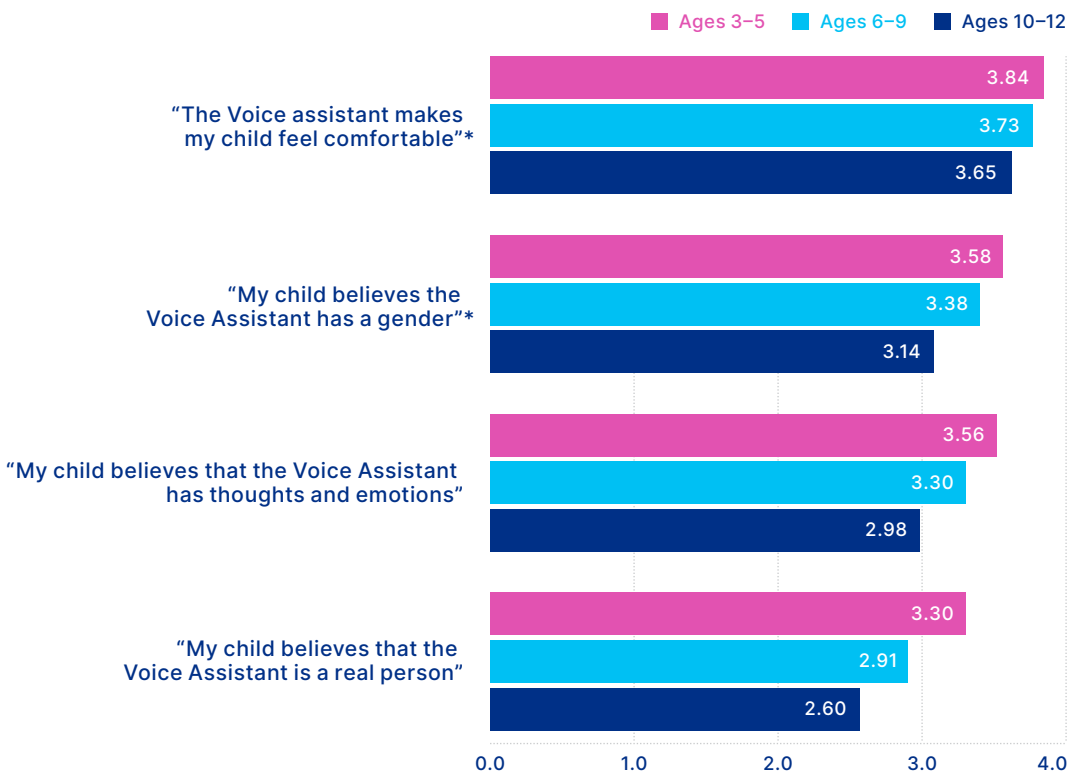
## KEY FINDINGS

However, only about one-third (33%) of parents reported that their children often or always used personal pronouns (e.g., he, she) when referring to a Voice Assistant. There were no significant differences in the use of personal pronouns among children of different ages.

Parents responded to questions about their child's beliefs about Voice Assistants that indicate the strength of a parasocial relationship, a one-sided relationship where a person feels an emotional connection to something or someone that does not reciprocate. Many parents (62%) agreed or strongly agreed that a Voice Assistant makes their child feel comfortable, while nearly half (48%) felt that their child believes the Voice Assistant has thoughts and emotions. Only 38% of parents agreed or strongly agreed that their child believes the Voice Assistant is a real person.

In general, the types of beliefs that could support a parasocial relationship between children and Voice Assistants were stronger among younger children. For example, parents of 3-5-year olds (Mean = 3.84) were significantly more likely to report that a Voice Assistant makes their child feel comfortable, compared to parents of 6-9-year-olds (Mean = 3.73) or 10-12-year-olds (Mean = 3.65). Similarly, parents of 3-5-year olds (Mean = 3.60) rated their children's beliefs that the Voice Assistant has a gender significantly higher than those of 6-9-year-olds (Mean = 3.40) or 10-12-year-olds (Mean = 3.10).

To what extent do you agree with the following statements about your child's perception of the Voice Assistant that they use the most?



### FIVE-POINT SCALE

1 = Strongly Disagree 2 = Disagree 3 = Neither Agree Nor Disagree 4 = Agree 5 = Strongly Agree



## KEY FINDINGS

# Voice Assistants in the Home & Family

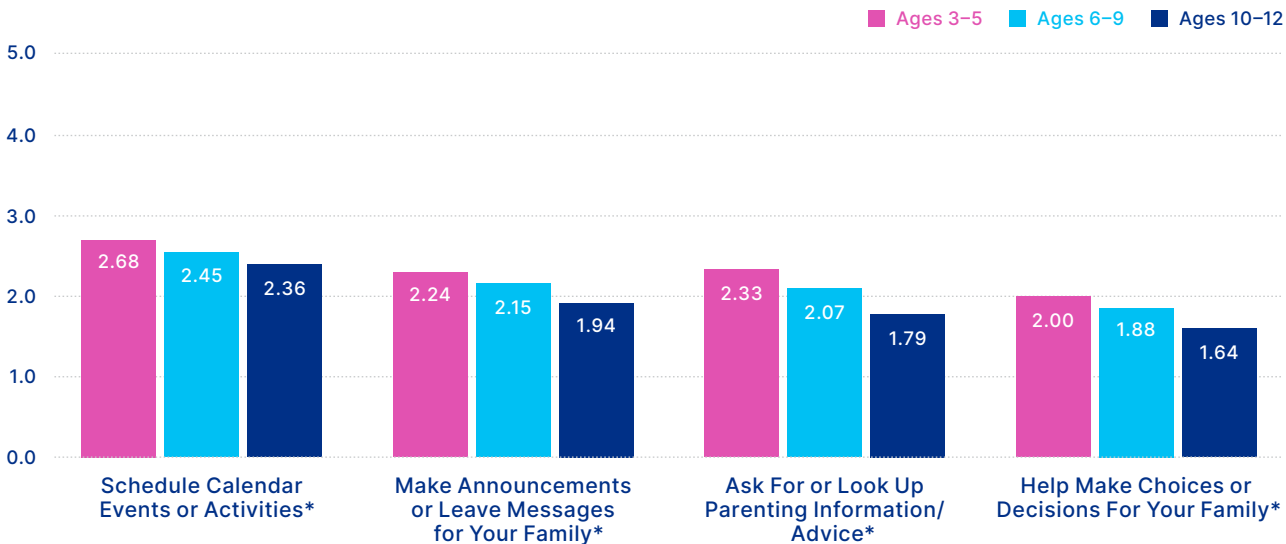
## Parents' Use of Voice Assistants

To better understand the role of Voice Assistants in the household, we asked parents about how they and their family interact with these tools.

Overall, many parents reported using Voice Assistants at least once per day for functional tasks (e.g., 50% to set reminders/timers/alarms), to seek information (e.g., 49% to check weather/sports/news, 45% to inquire about time/date/calendar events), and to connect with others (e.g., 45% to call someone, 47% to message someone). In contrast, a smaller proportion of parents used Voice Assistants at least once per day for more direct family management tasks: for example, 26% to ask for/look up parenting information/advice, 26% to make announcements/leave messages for the family, 23% to help make choices or decisions for the family, and 21% to help solve family disagreements/conflict.

Parents of younger children more often used Voice Assistants for family management tasks, including asking for or looking up parenting information/advice, helping make family choices or decisions, and making announcements or leaving messages for the family.

### How frequently do you use Voice Assistants for the following tasks?



#### SIX-POINT SCALE

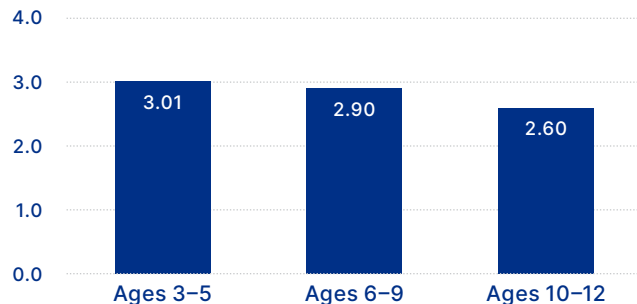
0 = Not at All 1 = A Few Times a Month or Less 2 = Once a Week 3 = A Few Times a Week 4 = Once a Day 5 = More Than Once a Day

## KEY FINDINGS

### Parents' Co-Use of Voice Assistants with Children

Overall, parents used Voice Assistants significantly more often with younger children, beginning with those ages 3 to 5 (Mean = 3.01), followed by 6 to 9 years old (Mean = 2.9) and 10 to 12 years old (Mean = 2.6). Among parents using Voice Assistants with their children, most reported seeking information or asking questions (65%) and listening to music or stories (63%) either often or always. The only significant differences in co-use of Voice Assistants by child age involved playing games, which was more frequent for parents of younger children.

How often do you use Voice Assistants together with your child?\*



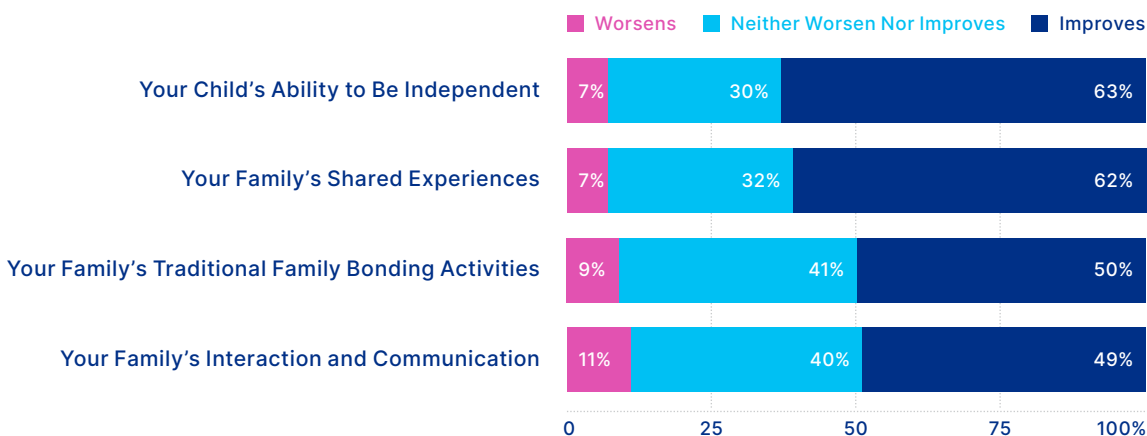
FIVE-POINT SCALE

0 = Never 1 = Rarely 2 = Sometimes 3 = Often 4 = Always

### Family Dynamics

Around 63% of parents felt that Voice Assistants improved their child's ability to be independent. 62% felt that Voice Assistants improved their shared experiences (e.g., listening to the same music), while 50% said that Voice Assistants improved their traditional family bonding activities (e.g., watching a movie together). Nearly half (49%) of parents felt that the use of Voice Assistants in the home improved their family's overall interactions and communication.

How much do you think the use of Voice Assistants improves or worsens each of the following?

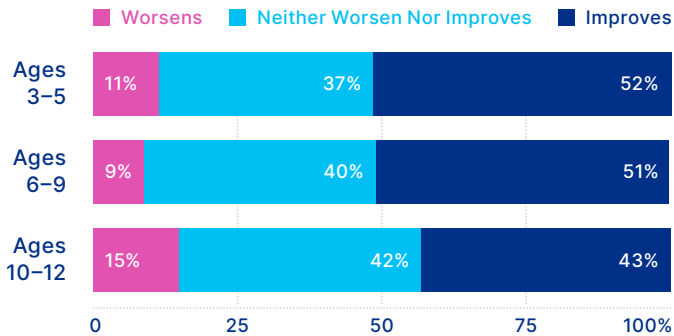


\*When applicable, statistically significant relationships are indicated with an asterisk.

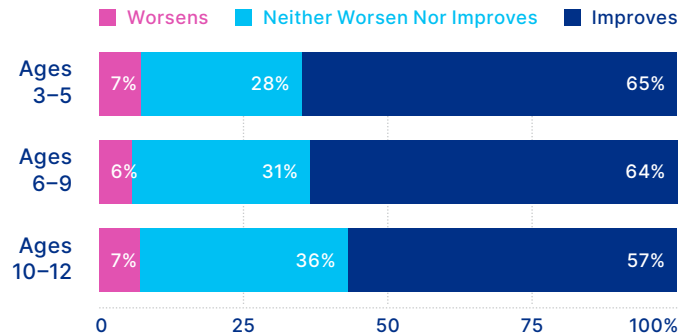
## KEY FINDINGS

A significantly larger portion of parents with younger children reported a positive impact of Voice Assistant use on family interaction and communication, as well as shared family experiences, compared to parents of older children. Among parents of children ages 3 to 5, 52% felt that using Voice Assistants improved their family’s interaction and communication, compared to 51% of 6–9-year-olds and 43% of 10–12-year-olds. Similarly, 65% of parents with 3–5-year-olds felt that Voice Assistants improved their shared family experiences, compared to 64% for parents of 6–9-year-olds and 57% of 10–12-year-olds.

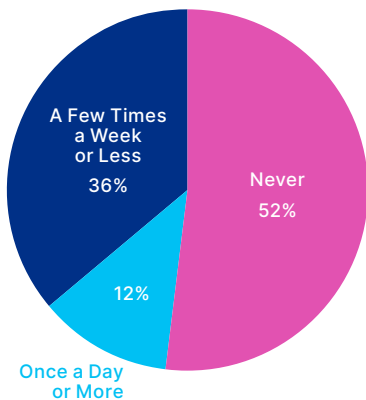
### Improves or Worsens Interaction or Communication\*



### Improves or Worsens Shared Experiences\*



In the last 30 days, how often did you, your child, or other people in your household have disagreements about the use of Voice Assistants?



Parents differed in their attitudes about the influence of Voice Assistants on family interaction, communication and shared experiences. Both parental education ( $\beta = .17, p < .001$ ) and household income ( $\beta = .10, p < .01$ ) were positively associated with parents’ perceived impact of Voice Assistants on these family dynamics (adjusted R-squared = .06,  $p < .001$ ). In other words, parents with a higher degree of education and higher income tended to view these Voice Assistants more positively in terms of their impact on their family. (See “Regression Analysis” in Methodology for details.)

Finally, we asked parents whether the Voice Assistants had led to any conflict within the family. The majority (52%) reported that no one in their household had a disagreement about the use of Voice Assistants at all within the past month, although a small minority of parents (12%) said their family had daily disagreements about Voice Assistants.

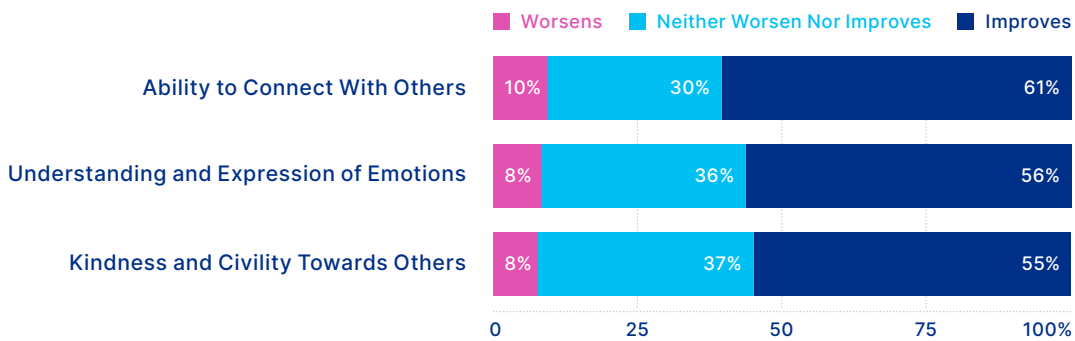
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# Parent Perceptions of Voice Assistants

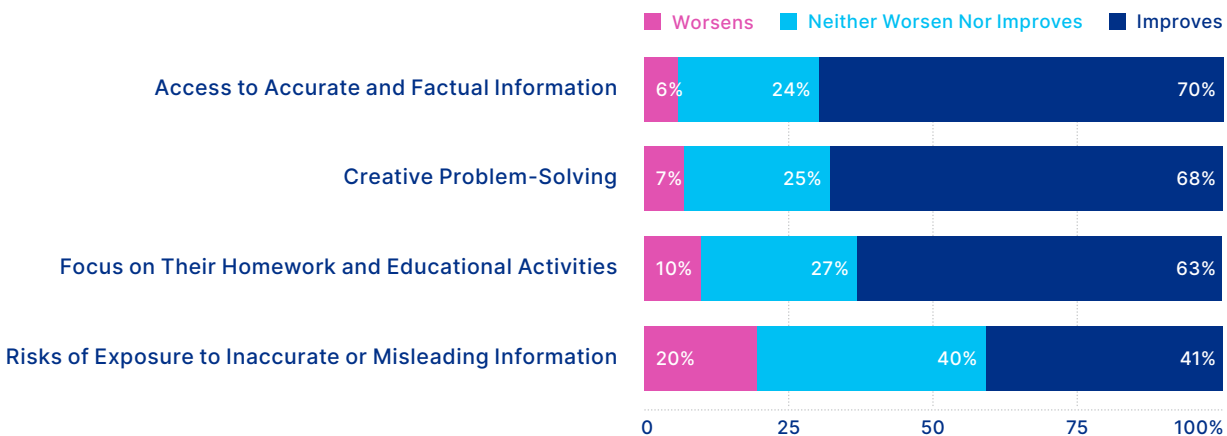
## Perceived Impact on Learning & Social Skills

The majority of parents felt that Voice Assistants improved their child’s access to accurate and factual information (70%), creative problem-solving abilities (68%), and focus on homework and educational activities (63%). Similarly, a majority of parents felt that their children’s use of Voice Assistants improved their ability to connect with others (61%), their understanding and expression of emotions (56%), and their kindness and civility towards others (55%). On the other hand, only 41% of parents felt that Voice Assistants improved the risk of exposure to inaccurate or misleading information, while 39% thought that Voice Assistants neither worsened nor improved this risk.

To what extent do you think your child’s use of Voice Assistants improves or worsens your child’s social skills in the following ways?



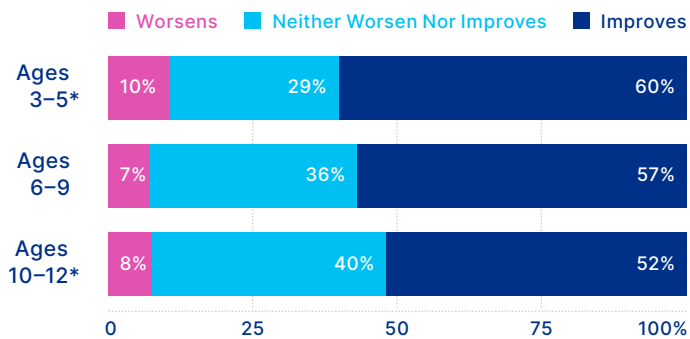
To what extent do you think your child’s use of Voice Assistants improves or worsens your child’s learning and education in the following ways?



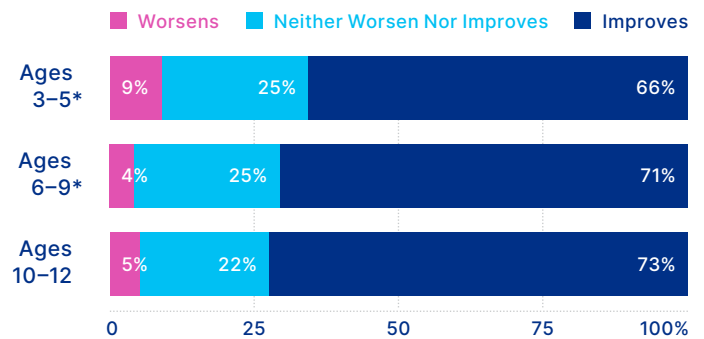
## KEY FINDINGS

A significantly higher percentage of parents with children ages 3 to 5 (60%) reported that the use of Voice Assistants improved their child’s ability to understand and express emotions compared to parents of children ages 10 to 12 (52%). However, significantly more parents of children ages 3 to 5 (9%) also believed that Voice Assistants worsened their child’s access to accurate and factual information compared to parents of children ages 6 to 9 (4%).

### Ability to Understand and Express Emotion



### Access to Accurate and Factual information



When looking more closely at the perceived impact of Voice Assistants on children’s learning and social skills, parent demographics once again played a significant role in these perceptions. Both parental education ( $\beta = .14, p < .001$ ) and household income ( $\beta = .08, p < .01$ ) predicted the perceived impact on learning ( $R^2 = .04, p < .001$ ), while parental education also predicted the perceived impact on children’s social skill development ( $\beta = .16, p < .001, R^2 = .04, p < .001$ ). In other words, parents with higher educational degrees were significantly more likely to view the impact of Voice Assistants on their children’s learning and social development in a positive light.

Children’s parasocial relationships with Voice Assistants and parents’ unease with these technologies also predicted parents’ beliefs about Voice Assistants as tools for learning, but in opposite ways. Children who demonstrated signs of parasocial relationships with Voice Assistants had parents who expressed more positive beliefs about the impact of Voice Assistants on learning. On the other hand, the more unease that parents felt around virtual assistants, the less positive they felt about the impact of these devices on learning.

Associations were tested using a series of hierarchical regressions and found this pattern of results for parent report of the impact of Voice Assistants on children’s focus ( $\beta_{\text{parasocial}} = .343, \beta_{\text{unease}} = -.180, R^2 = .135$ ), problem-solving ( $\beta_{\text{parasocial}} = .362, \beta_{\text{unease}} = -.171, R^2 = .144$ ), and access to factual information ( $\beta_{\text{parasocial}} = .303, \beta_{\text{unease}} = -.212, R^2 = .124$ ). All relationships reported were significant at a  $p < .001$  level. The results held for social outcomes as well including social connection ( $\beta_{\text{parasocial}} = .384, \beta_{\text{unease}} = -.144, R^2 = .183$ ), civility ( $\beta_{\text{parasocial}} = .429, \beta_{\text{unease}} = -.149, R^2 = .208$ ), and emotional intelligence ( $\beta_{\text{parasocial}} = .415, \beta_{\text{unease}} = -.109, R^2 = .191$ ).

(See “Regression Analysis” in Methodology for details.)

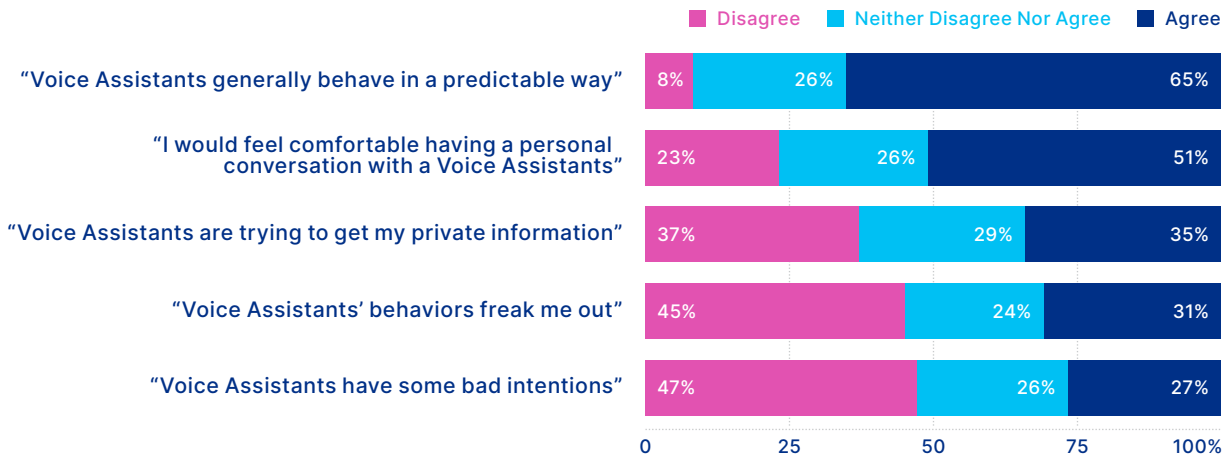
\*When applicable, statistically significant relationships are indicated with an asterisk.

## KEY FINDINGS

### Parent’s Ease and Unease around Voice Assistants

65% of parents agreed or strongly agreed that Voice Assistants behave in a predictable manner, and 51% felt comfortable having a personal conversation with a Voice Assistant. Meanwhile, 34% of parents agreed or strongly agreed that Voice Assistants were trying to get their private information, 31% said that they were “freaked out” by these tools, and 27% felt that they had “bad intentions”.

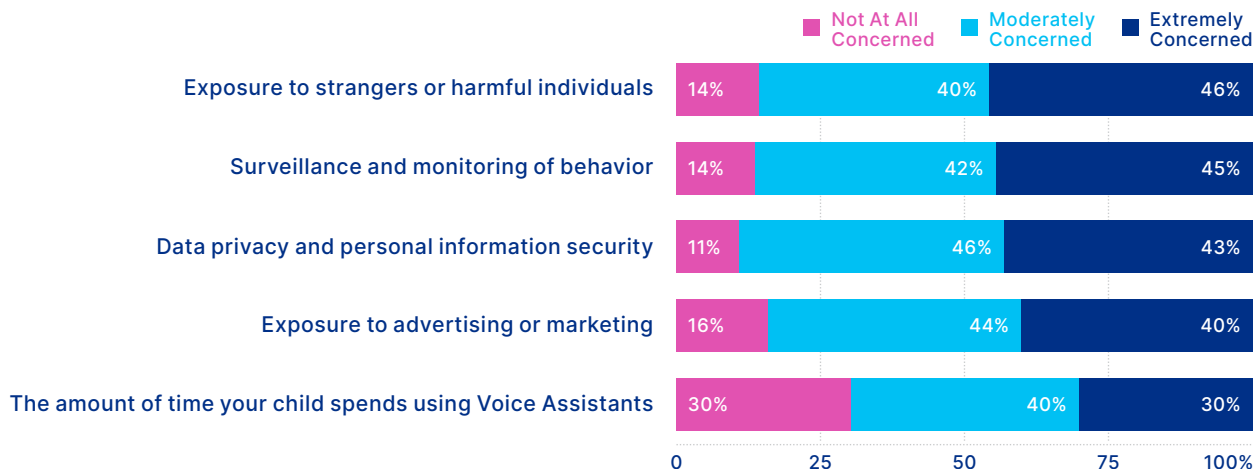
How much do you agree with each of the following statements about Voice Assistants?



### Parent Concerns Regarding Their Child’s Use Of Voice Assistants

Over 40% of parents expressed being “very” or “extremely” concerned about each of the following risks related to their child’s use of Voice Assistants: data privacy, exposure to strangers/harmful others, surveillance/monitoring of behavior, and exposure to ads/marketing materials. Parents appeared less concerned about the amount of time their child spends using Voice Assistants (30% “very” or “extremely” concerned, 30% “not at all concerned”).

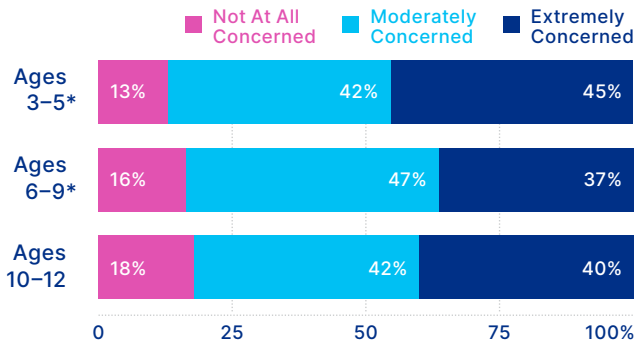
How concerned are you about the following issues related to your child’s use of Voice Assistants?



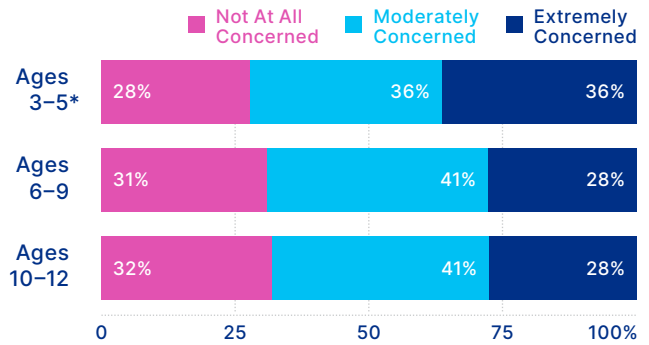
## KEY FINDINGS

A significantly higher percentage of parents with children ages 3 to 5 (45%) reported being extremely concerned about their child being exposed to advertising or marketing via Voice Assistants than did parents of children ages 6 to 9 (37%). Similarly, a significantly larger portion of parents with children ages 3 to 5 (36%) reported that they were extremely concerned about the amount of time their child uses Voice Assistants than parents of children ages 6 to 9 (28%) and ages 10 to 12 (28%). Overall, these trends indicate that parents are more concerned about younger children’s use of Voice Assistants, particularly children ages 3 to 5.

### Concerns of Exposure to Advertising or Marketing



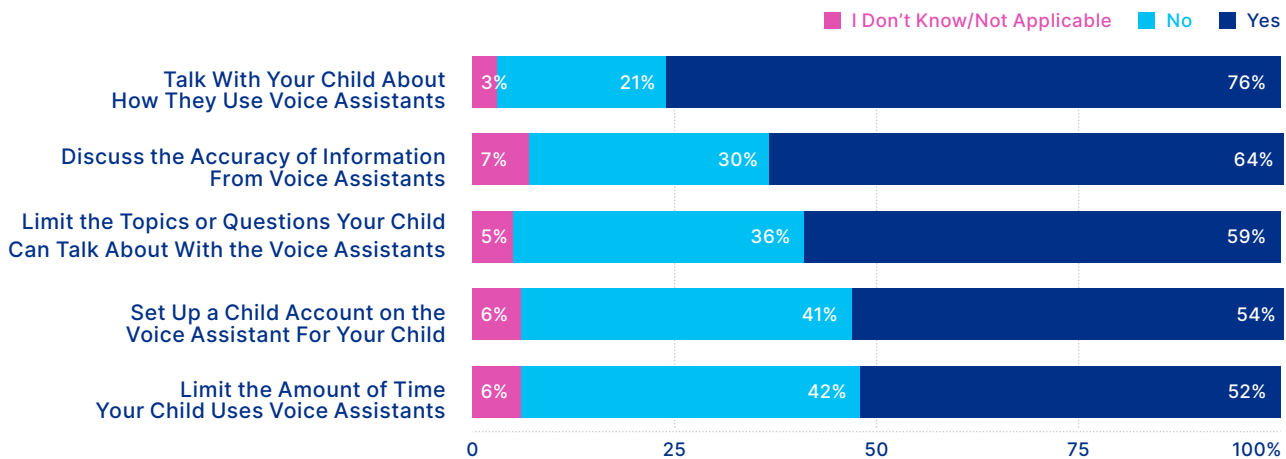
### Concerns of the Amount of Time Spent Using Voice Assistants



## Parental Mediation of Voice Assistants

Parents may implement a number of mediation strategies, or rules, to help structure their child’s use of media and digital technology. More than half of parents indicated that they had conversations with their child regarding their use of Voice Assistants (76%), talked with their child regarding the accuracy of information provided (64%), and set up a child account for their child (54%). Parents were also more likely than not to have rules surrounding the amount of time their child could use a Voice Assistant (52%) and the topics their child could discuss with a Voice Assistant (59%).

### Have you ever done any of the following?

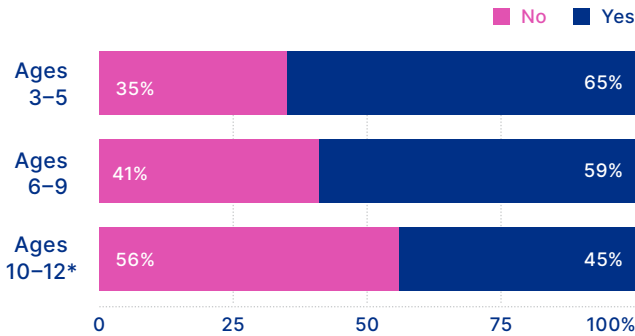


\*When applicable, statistically significant relationships are indicated with an asterisk.

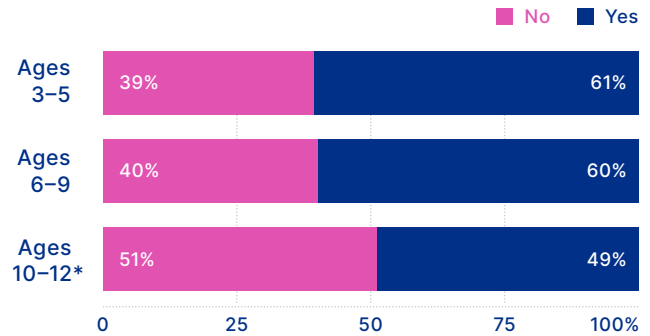
## KEY FINDINGS

A significantly higher percentage of parents with children ages 10 to 12 (56%) reported that they did not have rules regarding the amount of time their child uses Voice Assistants, compared to parents of children ages 3 to 5 (35%) and 6 to 9 (41%). Similarly, a larger proportion of parents with children ages 10 to 12 (51%) reported that they did not set up a child account, compared to parents of children ages 3 to 5 (39%) and 6 to 9 (40%). Altogether, these results suggest that pre-teens experience a greater deal of autonomy and freedom in their use of Voice Assistants compared to younger children.

### Limit Amount of Time on Voice Assistants



### Set up Child Account on Voice Assistant



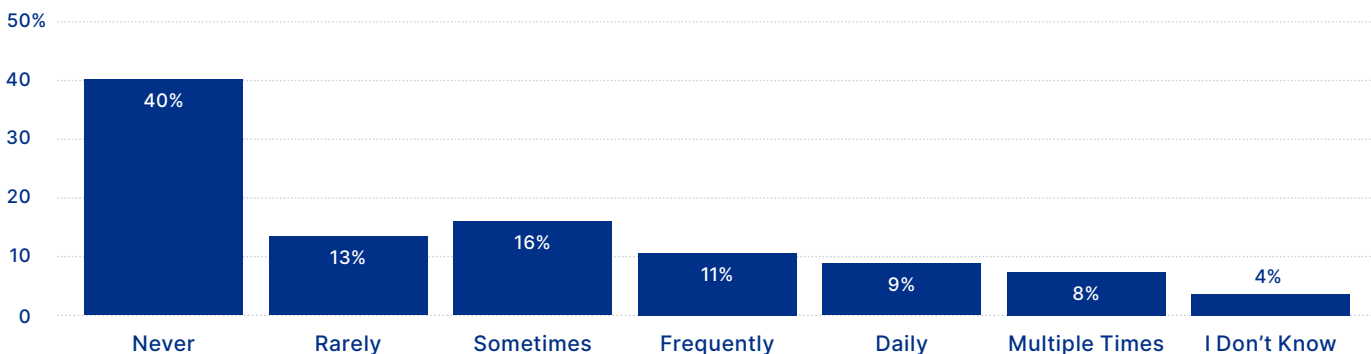
\*When applicable, statistically significant relationships are indicated with an asterisk.

# Generative AI

## Children's Use Of Generative AI

According to parents, 40% of children have never used Generative AI tools like ChatGPT. 29% of children used these tools either rarely or sometimes, whereas 16% used it at least daily.

### How often has your child used a Generative AI, such as ChatGPT?



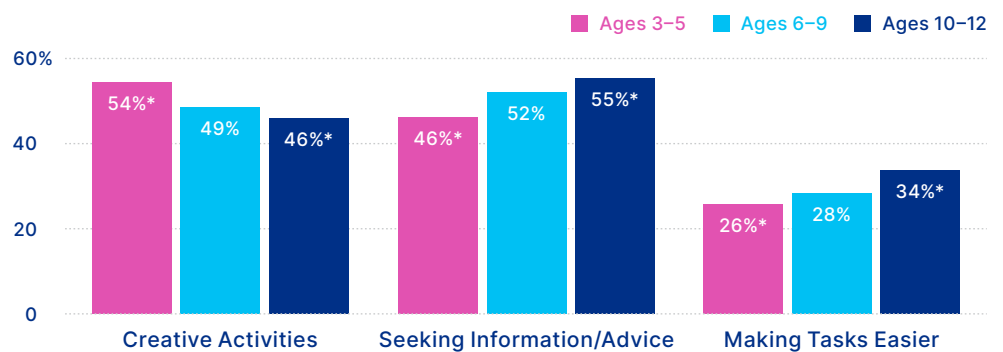


## KEY FINDINGS

Generative AI tools offer new ways for children to learn and explore information, in addition to streamlining daily activities (e.g. drafting emails/texts, summarizing readings, help with work/homework). About half of parents indicated that their child has used Generative AI to seek out information/advice (51%) and for creative activities (50%). In contrast, less than one-third of parents (29%) reported that their child used Generative AI to make tasks easier.

A significantly higher percentage of parents with children ages 3 to 5 (54%) reported that their child has used Generative AI for creative activities, compared to parents of children ages 10 to 12 (46%). On the other hand, a significantly smaller proportion of parents with children ages 3 to 5 (46%) reported that their child has used Generative AI to seek information/advice, compared to parents of children ages 10 to 12 (55%). Lastly, a significantly smaller group of parents with children ages 3 to 5 (26%) reported that their child has used Generative AI to make tasks easier, compared to parents of children ages 10 to 12 (34%). In all, young children's use of Generative AI appears to revolve around creative activities, whereas tweens increasingly leverage the technology for more practical tasks.

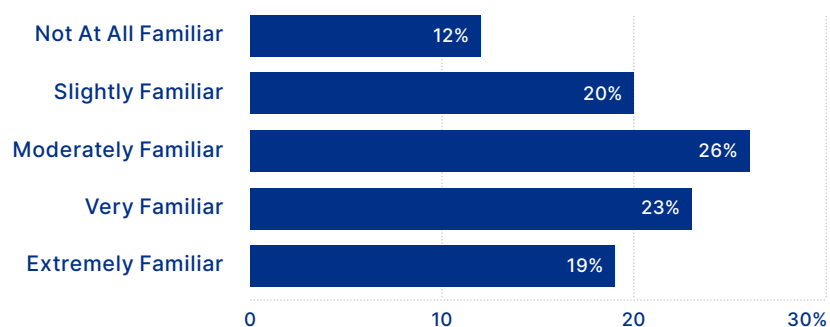
Which of the following do you know your child used Generative AI to do? (select all that apply)



## Parents' Use Of Generative AI

Only a small percentage of parents (12%) indicated that they were not at all familiar with Generative AI applications like ChatGPT, while about half indicated they were moderately (26%) or slightly familiar (20%). About one-quarter of parents indicated they have never used Generative AI, with a similar amount being daily users of the technology.

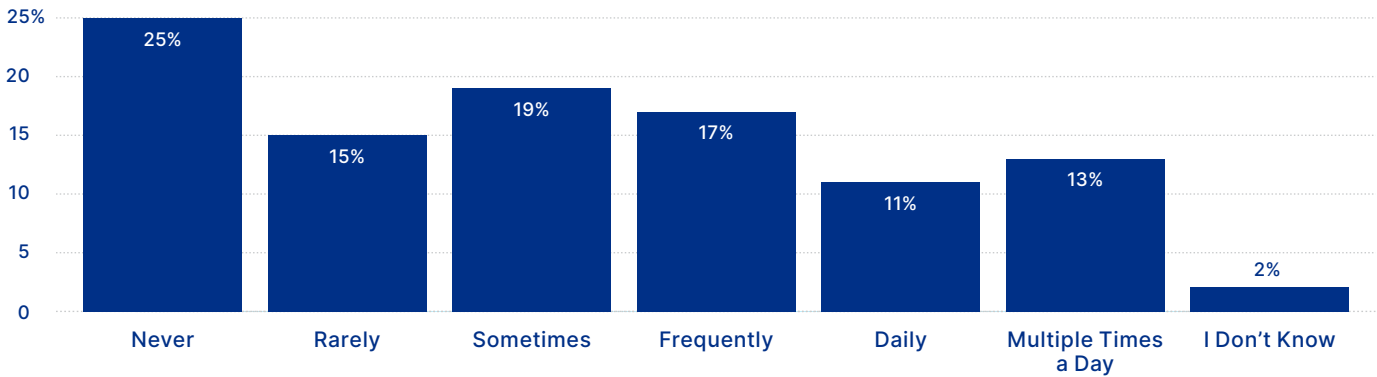
How familiar are you with Generative AI, such as ChatGPT?



\*When applicable, statistically significant relationships are indicated with an asterisk.

## KEY FINDINGS

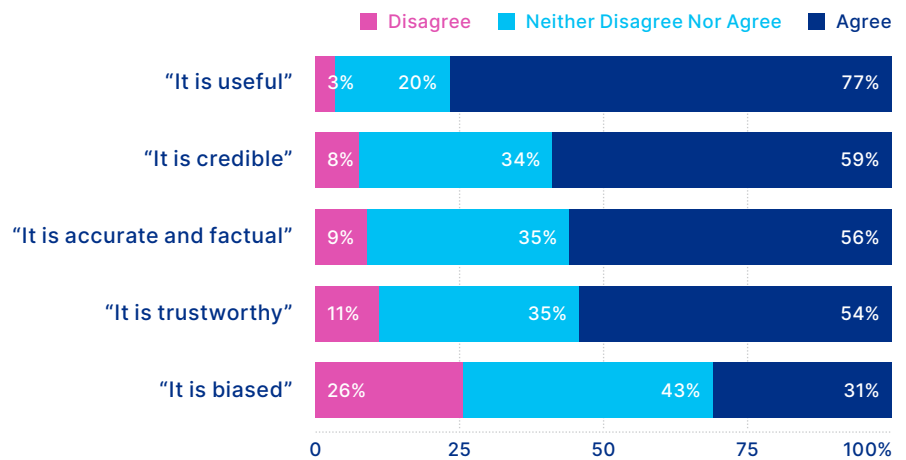
How often do you use Generative AI, such as ChatGPT?



## Parent Perceptions of Information Produced by Generative AI

The majority of parents agreed that information produced by Generative AI is useful (77%), credible (59%), accurate and factual (56%), and trustworthy (54%). However, 31% of parents agreed that the output generated by these applications is “biased”; 43% neither disagreed nor agreed with this statement, and only 26% disagreed. Overall, parents generally held the output of Generative AI applications in high regard, although there were some concerns around the potential for producing biased information.

How much do you agree with the following statements about the information Generative AI produces?



## KEY FINDINGS

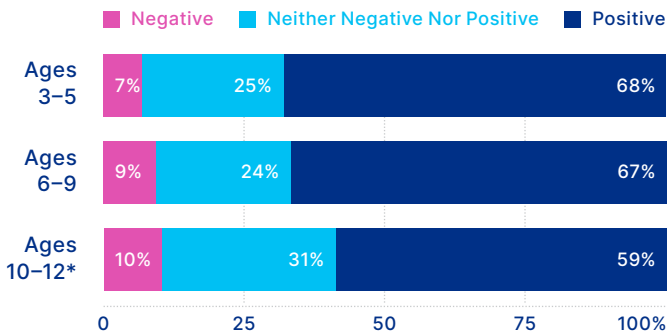
### Perceived Impact Of Generative AI

The rise of Generative AI has raised questions around how it will impact children’s learning and development. Across the board, most parents perceived Generative AI as having a positive impact on their child’s curiosity/desire to learn (66%), imagination/creativity (65%), critical thinking skills (59%), education/schooling (58%), and social skills (50%). In contrast, only a minority of parents felt Generative AI had a negative impact on education/schooling (11%), curiosity/desire to learn (7%), imagination/creativity (9%), critical thinking skills (13%), and social skills (16%).

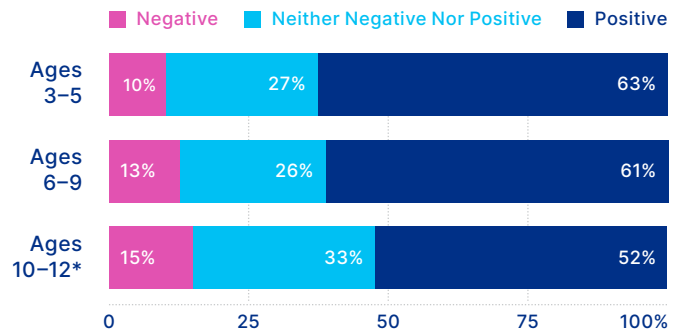
Parents of children in the two youngest age groups (3-5 and 6-9) were more likely than parents of older children (10-12) to report a positive impact of Generative AI on their child’s imagination/creativity and critical thinking skills. These age groups also differed in terms of the perceived impact of AI on social skills: parents of young children (3-5) were significantly more likely to perceive a positive impact of Generative AI on their child’s social skills compared to parents of children ages 10 to 12.

As your child grows up, what type of impact do you believe that Generative AI (e.g., ChatGPT) will have on their...?

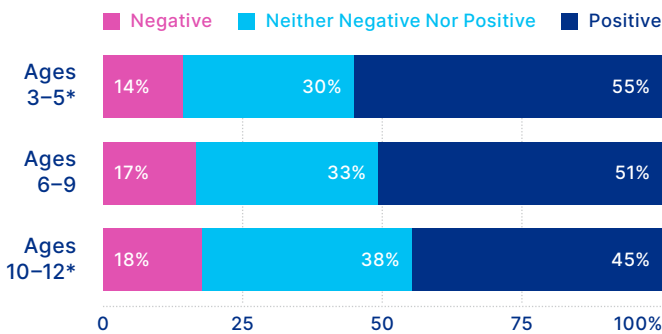
#### Imagination/Creativity



#### Critical Thinking Skills



#### Social Skills



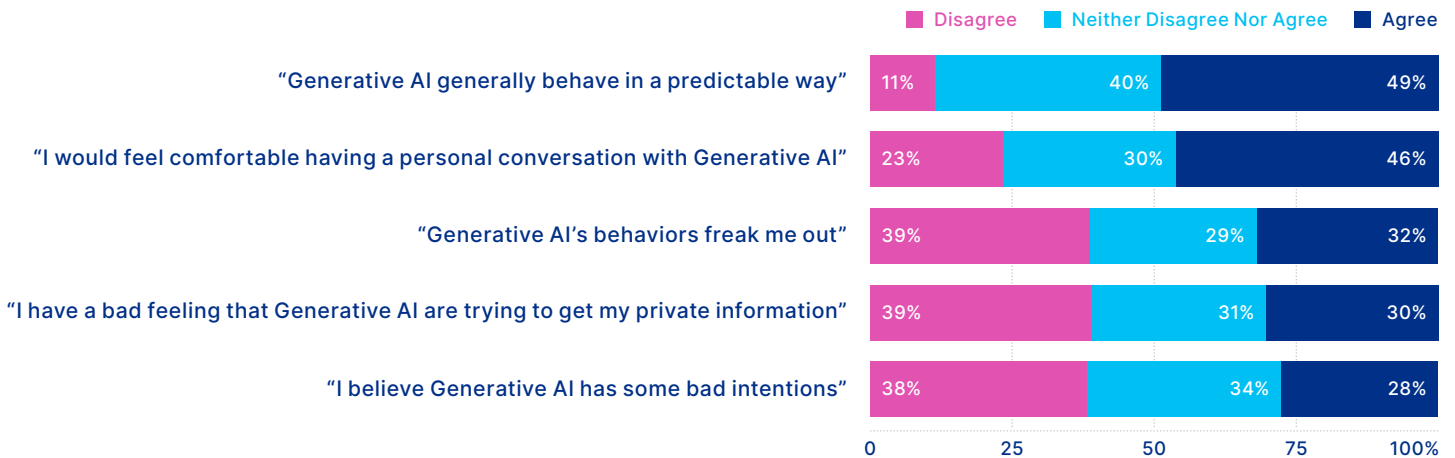
\*When applicable, statistically significant relationships are indicated with an asterisk.

## KEY FINDINGS

### Parents' Ease and Unease around Generative AI

Roughly half (49%) of parents agreed or strongly agreed that Generative AI behaves in a predictable way, and 46% would be comfortable having a personal conversation with such a tool. On the other hand, 28% agreed or strongly agreed that Generative AI has some “bad intentions”, 32% were “freaked out” by AI’s behavior, and 30% felt that these tools are trying to get their private information.

How much do you agree with each of the following statements about Generative AI?

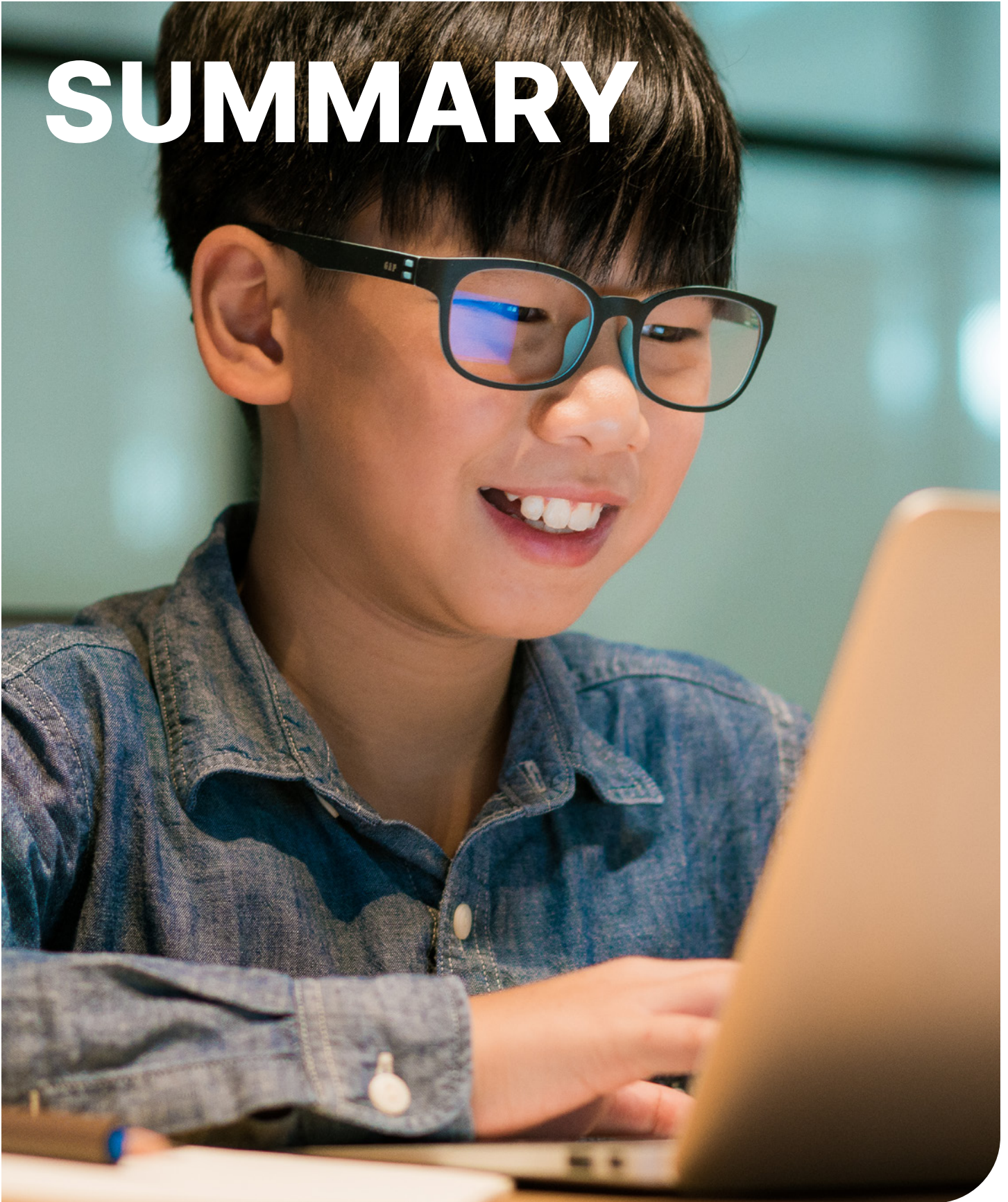


Given the novelty of Generative AI, we also compared parents’ ease and unease of these technologies with those of more traditional Voice Assistants. On average, parents were significantly more concerned that Voice Assistants are trying to get their private information (Mean = 2.93) compared to Generative AI (Mean = 2.82); however, it is worth noting that both values are below the midpoint of our scale (1= strongly disagree, 3= neither disagree or agree, 5= strongly agree), implying that most parents do not strongly believe either of these technologies are intruding on their privacy. On the other hand, parents rated Voice Assistants significantly higher (Mean = 3.79) on average compared to Generative AI (Mean = 3.42) in terms of predictability, although both sets of responses leaned towards classifying these technologies as predictable in their behavior.

Concerning comfort in having personal conversations, parents also responded significantly more favorably about towards Voice Assistants (Mean = 3.41) compared to Generative AI (Mean = 3.26). This suggests that parents feel significantly more at ease engaging in personal conversations with Voice Assistants than with Generative AI, despite higher concerns that the former may be accessing their private information.



# SUMMARY



# Summary

## Key Findings

Voice Assistants have found a place in the homes of American families, and parents report that their children use them for a wide array of reasons, including connecting with other people, answering questions, or simply being entertained. While some parents, particularly those with younger children, expressed concerns around privacy, safety, and advertising, the majority see Voice Assistants as having a positive impact on family connection as well as the education and social skills of their children. Parents hold similar views about Generative AI, reporting that it will likely have beneficial effects on their child's learning and development as they age.

### Young people are active users of Voice Assistants and use them as resources for connecting with other people, supporting their learning, and having fun.

- Children as young as preschoolers own or have access to devices with Voice Assistants. While ownership of smartphones increases with age, it is even very common among 3 to 5-year-olds, almost half of whom (44%) own a smartphone.
- Roughly half of young people who use Voice Assistants have access to smart devices (e.g., smart speakers) that facilitate a more public and potentially communal family experience.
- The most common daily activities for children involving Voice Assistants are for entertainment, with over half of the 10- to 12-year-olds listening to music every day (56%) and almost as many playing games or taking quizzes (45%).
- Older children use Voice Assistants more frequently than younger children for almost all activities, including connecting with other people (e.g. calling or messaging), getting information (e.g. weather or time), and educational activities (e.g. help with homework, answering questions). Educational activities are fairly common, with 36% of 10-12 year-olds using Voice Assistants to help with their homework on a daily basis.

### Many children appear to form relationships with Voice Assistants, as indicated by their behaviors toward the devices and beliefs about them. Younger children are more likely to be polite toward Voice Assistants and to believe that they have qualities of real people.

- Children's behaviors toward Voice Assistants can be quite telling regarding their beliefs about them as "real": when interacting with Voice Assistants, a majority (64%) always or often used polite words like please and thank you, although this was less common among older children (ages 10 to 12).
- Many children typically referred to Voice Assistants using a personal pronoun (he or she), but did not seem to differ by age in this behavior.
- Older children were less likely to hold beliefs that indicate a relationship with the Voice Assistant, including if it is a real person and has thoughts and emotions.

## SUMMARY

For parents, Voice Assistants are used daily for functional tasks and occasionally for family management. Many parents see Voice Assistants as improving their family functioning and their child's independence, but occasional disagreements about their use do occur.

- Most of the parents surveyed used Voice Assistants at least a few times a week for a wide variety of tasks. For close to 50% of parents, these platforms served as a functional tool used daily to set reminders, check weather, or get news and other information.
- While the majority of parents reported using these devices as a family management tool to help make decisions or solve disagreements, they did this less frequently – usually a few times a week or month.
- Many more parents see Voice Assistants as improving aspects of their family lives than worsening them: over half say they improve their family's shared experiences, while slightly fewer see them as a positive influence on their family's communication and bonding activities.
- Voice Assistants may also serve as a tool for parents to encourage their children's autonomy, as more than 60% reported that they improve their child's ability to be independent.
- While around 30-40% of parents reported no impact of Voice Assistant use on their families, very few (<10% for most questions) reported they worsened family functioning. Some families did have disagreements about the use of Voice Assistants, but these arguments were rare (more than 40% reported this happening a few times a month or less).

Parents generally see Voice Assistants as having a positive impact on their children's learning and social development. However, many parents, especially those with young children, are concerned that Voice Assistants may expose children to strangers and put their private information at risk.

- A majority of parents (over 60%) felt that Voice Assistants improved their child's learning and education, including access to information, focus on homework, and creative problem-solving.
- Similarly, the majority of parents reported that Voice Assistants improved their children's social skills, including their ability to show kindness towards and connect with others.
- Nearly half of parents (over 40%) reported concerns about risks their child may face when using Voice Assistants, including exposure to strangers, data security, and surveillance. Parents of younger children voiced more concern regarding exposure to advertising, monitoring of their child's behavior, and the amount of time their child spends using these devices. The amount of time spent using these devices seemed to be the least concerning, with over 30% of parents saying they were not at all concerned about it.
- Parents are involved in how their children use Voice Assistants, with many of them (roughly three-quarters) talking with their children about the use of these devices. Parents of younger children were more likely to limit the amount of time they spend using Voice Assistants and the topics they can ask about.

## SUMMARY

- Parents tended to agree that Voice Assistants could play a social role for their child, with roughly half agreeing that they can serve as a companion (49%) and reduce loneliness (50%).
- In general, most parents were fairly at ease with the behaviors and functions of Voice Assistants. About one-third, however, did agree that they were trying to obtain their private information. Parents of the youngest children (ages 3 to 5) reported more negative beliefs about the behaviors and intent of Voice Assistants.
- Parents who reported more behaviors and beliefs indicating stronger parasocial relationships between their child and the Voice Assistant gave more positive endorsements of Voice Assistants' impact on their child's education and social skills. The reverse was true for parents who were more uneasy about these devices, in that they gave more negative endorsements.
- Parental education was also linked to their perceived impact of Voice Assistants. The more education the parents have obtained, the more positive they felt about the impact of Voice Assistants on their family dynamics.

**Young children appear to use Generative AI more as a search engine and creative tool rather than something to assist with necessary tasks. Parents are fairly active users of Generative AI, and more than half see it as being a useful and trustworthy tool that will have a positive impact on their child's learning and development.**

- Parents are split in terms of their level of experience with Generative AI, with similar amounts (~25%) never using it and using it at least once a day.
- Although children appear to use Generative AI less often than parents, almost half (43%) of children use it at least sometimes.
- According to parents, younger children typically use Generative AI for creative activities, whereas older children use it for seeking information and making other tasks easier (although the latter is less common, even among older children)
- Parents generally hold positive attitudes about Generative AI, with more than three-quarters (77%) agreeing that it is useful and more than half saying it is accurate, credible, and trustworthy. Despite seeing the output generated by these applications as useful and generally correct, many parents appear to recognize that AI models still are limited in their ability to generate information impartially or without bias.
- Most parents reported that Generative AI would have a positive impact on their child's development, including their education, curiosity, imagination, critical thinking skills, and social skills.



## SUMMARY

### Implications

As we move toward an AI-saturated future, we can use parents' and children's existing behaviors regarding Voice Assistants and Generative AI to identify how they view the risks and opportunities of their children's interactions with these technologies. Below are some implications for families, tech designers, and other key stakeholders:

**Many parents see Voice Assistants as having a positive impact on their children's learning and social development.**

Voice Assistants and other character-based AI hold great potential as educational tools for younger children. Findings from this research show that this technology is already integrated into the household with many parents seeing it as having a positive impact on their children and families. Considering that entertainment is such a popular use of these devices, packaging information as music, fun quizzes, and games will likely increase their use. Because parents with lower levels of education and those who are less at ease with this technology see these devices as less beneficial to their children, any educational efforts would need to engage with these parents. Also, positive attitudes for these devices are less strong among parents with older children, potentially making it more difficult to reach an audience of tweens with this technology.

**Voice Assistants have found a role in the home that many parents see as beneficial to the connection and functioning of their family.**

Parents regularly access functions of Voice Assistants that can help manage their families, including timers, reminders, calendars, and similar features. Tools designed explicitly to serve family needs could be especially useful. Beyond serving as family management tools, Voice Assistants seem to be contributing to key aspects of family interaction and communication by providing opportunities to enjoy content together. Parents can take advantage of these functions to encourage and enhance family time together, and designers can produce more opportunities for this type of shared experience.

**Younger children had stronger parasocial relationships with Voice Assistants than older children, making them an audience for effective education through this platform but also putting them at higher risk for any negative effects of advertising.**

Voice Assistants often have names, human voices, and personalities. It is not surprising, then, that young children seem to be forming relationships with them, using polite language, and otherwise treating them like people. Parents who reported stronger evidence of these relationships for their children also said that the devices are more effective teachers. We also know, however, that these relationships can be used as tools to increase advertising effects. Parents can talk with their children about how they view and behave toward these characters, and designers should utilize these connections to build effective educational content.

## SUMMARY

**Although many children have never used Generative AI, a substantial number (~16%) use it every day, mainly for searching and creative endeavors.**

Generative AI has almost endless functionality. Currently, it seems that younger children are using it for functional and fun tasks, including looking for information and being creative. Other research has shown that many teens (77%) use these platforms to improve their efficiency (FOSI, 2023). While the current observed use patterns reflect developmentally appropriate pursuits, parents may be able to encourage their younger children to explore other uses for this technology, and designers can create interfaces that inspire a wide range of queries.

**Many parents hold positive beliefs about the information provided by Generative AI as well as its impact on key areas of their child's development.**

Overall, the parents surveyed generally expressed favorable sentiments towards the output produced by Generative AI, with many saying it is useful, accurate, and trustworthy. Coupling that with their beliefs that it will have a positive impact on their child's creativity and critical thinking, we would expect them to encourage their children's use. That said, many did recognize the potential for bias in these platforms and rated their behavior as less predictable than Voice Assistants. As these platforms become more widely used, parents need to explore their use with their child and help build a healthy skepticism that can serve as a basis for digital literacy in this area.

It is important to note that our sample is parents whose children use Voice Assistants. They may, therefore, hold more positive views about Generative AI than parents in general. However, in another national study, 66% of US parents felt positive about their teens' use of Generative AI (FOSI, 2023) which is quite similar to related findings in this study.



# METHODOLOGY

# Methodology

This report presents findings from a comprehensive national online survey conducted with 1,447 parents (ages 18 or older) of children ages 3 to 12 across the United States. Participants were recruited through Alchemer, an online research platform that connects with over 350 survey panels, encompassing a global network of over 437 million users. American parents who pre-registered with these panels were invited to participate.

We established a variety of quotas, including race/ethnicity, gender, child age, and school type to ensure a diverse and representative sample of participants from all 50 states and several US territories.

The demographic breakdown of respondents (parents) and/or their children was as follows:

- **Child age:** 28.6% ages 3-5 (N = 414), 39.9% ages 6-9 (N = 578), 31.4% ages 10-12 (N = 455)  
3 years old: 5 years old: 7 years old: 9 years old: 11 years old:  
9.5% (N = 138) 9.7% (N = 141) 9.9% (N = 143) 9.2% (N = 133) 8.4% (N = 122)  
4 years old: 6 years old: 8 years old: 10 years old: 12 years old:  
9.3% (N = 135) 10.7% (N = 155) 10.2% (N = 147) 11.1% (N = 160) 12% (N = 173)
- **Child gender identity:** 49.3% boys (N = 714), 50% girls (N = 724), 0.4% nonbinary/other (N = 7), 0.1% prefer not to answer (N = 2)
- **Child race/ethnicity\*:** 58.7% White/non-Hispanic (N = 850), 6.7% Multi-racial (N = 97), 11.1% Black/African American (N = 161), 17.3% Hispanic/Latino (N = 250), 4% Asian (N = 57), 0.8% American Indian/Alaskan Native (N = 12), 0.2% Native Hawaiian/Pacific Islander (N = 3), 0.1% Middle Eastern/North African (N = 2), 0.8% Other (N = 13), 0.1% Prefer not to answer (N = 2)
- **Parent race/ethnicity\*:** 64.6% White/non-Hispanic (N = 935), 11.1% Black/African American (N = 161), 2.8% Multi-racial (N = 41), 14.4% Hispanic/Latino (N = 209), 4.5% Asian (N = 65), 1.2% American Indian/Alaskan Native (N = 18), 0.3% Native Hawaiian/Pacific Islander (N = 4), 0.1% Middle Eastern/North African (N = 2), 0.7% Other (N = 10), 0.1% Prefer not to answer (N = 2)
- **Child school type:** 82.9% Public (N = 1,199), 8.5% private secular/non-religious (N = 123), 3% private parochial/religious (N = 44), 4.1% homeschool (N = 60), 1.5% other (N = 21)
- **Child school grade (or grade equivalent):** 13.6% Preschool/Pre-K (N = 196), 31.8% Kindergarten-2nd grade (N = 460), 34.3% 3rd-5th grade (N = 496), 20.3% 6th-8th grade (N = 294)
- **Parental education:** 2.8% no degree (N = 41), 33.4% High school/GED (N = 483), 20.6% Associate's degree (N = 298), 23.8% Bachelor's degree (N = 345), 15.4% Master's degree (N = 223), 3.9% PhD/MD/JD/other advanced degrees (N = 56).
- **Annual household income:** 33.3% Less than \$50,000 (N = 482), 33% \$50,000 - \$99,999 (N = 477), 18.3% \$100,000 - \$149,999 (N = 265), 7.9% \$150,000 - \$199,999 (N = 115), 3.2% \$200,000 - \$249,999 (N = 46), 3.6% \$250,000 or more (N = 52), 0.7% prefer not to answer (N = 10)

\* Respondents could choose as many categories as they wanted; in order to avoid counting participants twice, those who selected multiple choices are included in the "Multi-racial" category. Any respondent who selected "Hispanic" was included only in the Hispanic category regardless of other race/ethnicity selections they made. This approach results in the above-listed mutually exclusive categories.

## METHODOLOGY

Between December 18, 2023, and January 3, 2024, participants completed an online survey about their family's experiences with Voice Assistants in the home, including how it impacts family dynamics and children's learning and development; parents were also asked about their overall perceptions of both current and future AI technologies.

Participants were only qualified to participate in this survey if they confirmed having at least one child between ages 3 to 12 who actively uses Voice Assistants on any device. Participants with more than one child between the ages of 3 to 12 were instructed to answer about the child who interacts with AI Voice Assistants most frequently. If they had multiple children within the specified age range who used these assistants equally, they were instructed to choose one child at random.

The following definition of "AI Voice Assistant" was provided at the beginning of the survey:

*"Most of this survey is about your family's use of AI Voice Assistants (called 'Voice Assistants' in this survey). Voice assistants are applications like Siri, Amazon Alexa, and Google Assistant that often run on smartphones, smart speakers, computers, and other similar devices. They can understand voice commands and respond by answering questions, carrying out tasks, or providing other services.*

The final section of this survey asked about Generative AI technology, as defined below:

*"The next set of questions shift to asking about conversational or generative Artificial Intelligence (AI). These new forms of AI can generate new text, images, or other media in response to prompts based on existing data. Perhaps the most well-known Generative AI is Chat GPT, but other examples include Bard on Google and AI Chat on Instagram."*

For full list of the survey questions and response options, please refer to the Appendix at the end of this report.

The Boston Children's Hospital IRB reviewed the survey methodology and classified the study as exempt.

### Participant Consent

All participants were part of Alchemer's survey network and had previously agreed to be contacted for survey opportunities. At the beginning of our survey, participants were presented with detailed information about the study, including its purpose, potential risks, compensation details, contact information for the research team, and other pertinent details. By proceeding with the survey ('next button'), participants acknowledged their understanding of this information and consented to participate, with the option to withdraw at any time.

### Compensation

Participants received compensation from their respective survey companies in the form of points, proportional to the survey's length. These points could be redeemed for various rewards like Amazon gift cards, PayPal deposits, or upgrades to certain services, in accordance with each company's specific agreement. Compensation structures varied slightly between companies.

## METHODOLOGY

### Quality Control

Prior to the main data collection phase, a preliminary soft launch of the survey was conducted to assess completion rates and response patterns. This pilot test involved 34 respondents, whose data were subsequently excluded from the final analysis to account for adjustments made post-soft launch.

To ensure participant engagement and attention, we incorporated two “attention-check” questions in the survey. Participants who failed to answer either of these questions correctly (N = 270) were disqualified and redirected to an external webpage. We rigorously reviewed and cleaned the final data set to exclude incomplete or low-quality responses.

### Rounding Policy

Throughout this report, numerical values might not sum precisely to 100% due to rounding, the presence of multiple response options, or instances of skipped questions or responses.

### Gender Identity Categories

In our analysis, we primarily compared responses from participants identified as a “boy” or “girl”. Individuals identifying differently (e.g., non-binary, genderfluid) constituted less than 1% of our sample; due to this small representation, it was not feasible to perform meaningful comparative analysis for these categories.

### Scales

In our report, we have sometimes combined selectively recorded responses from more detailed scales to simplified three-point scales for ease of reporting and visualization:

- The original six-point frequency scale included the following responses: not at all, a few times a month or less, once a week, a few times a week, once a day, and more than once a day. This scale was sometimes consolidated into broader categories: “not at all”, “a few times a week or less” and “once a day or more”.
- The original five-point scale for assessing perceived impact of Voice Assistants on children included a range of responses: “worsens a lot”, “worsens a little”, “does not worsen or improve”, “improves a little”, to “improves a lot”. For certain analysis, these were grouped into three broader categories: “worsens”, “does not worsen or improve”, “improve”.
- Similarly, the five-point scale assessing agreement was also re-coded in some cases following a comparable logic to simplify the data presentation. The original responses included “strongly disagree”, “disagree”, “neither disagree nor agree”, “agree”, and “strongly agree”. In certain analyses, we consolidated these into three broader categories for ease of interpretation: “disagree”, “neither disagree nor agree”, and “agree”.

## METHODOLOGY

Survey questions around parents' ease or unease with technology (Q40, Q54) were adapted from a scale used by Xu et al (2023), while questions about children's parasocial relationships with Voice Assistants (Q31, 37, 42) were adapted from a scale used by Hoffman et al (2021).

### Regression Analysis

In our report, when we mention regression analysis, we are referring to a statistical method used to understand the relationship between different variables. This method helps us understand how the typical value of the dependent variable changes when one or more independent variables are varied. For example, it allows us to see how factors such as parental education or income might predict parents' perceptions about Voice Assistants or Generative AI.

The Beta ( $\beta$ ) value shows whether the relationship between variables is positive or negative and how strong this relationship is. A positive beta means that as the independent variable increases, the outcome variable tends to increase too, and vice versa for a negative beta.

R squared ( $R^2$ ) values show how much of the change in the outcome variable can be explained by changes in the independent variables. The closer squared R is to 1 (100%), the better our model explains the outcome variable.



# APPENDIX



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# Survey Questions

## Screener

### General Information

1. Please enter your age in years (please only use numbers)\*  
*Qualifier: Must be 18+*
2. Which country do you currently live in?\**Qualifier: Must be in the U.S.*
3. How many children do you have between the ages of 3-12 years old?\*Choose one: 0, 1, 2, 3, 4, 5 or more  
*Qualifier: Must have at least 1*
4. Please list the ages of all the children under the age of 19 living with you.  
(If you have more than one child, please list their ages separated by a comma. Example: 4, 7, 18)\*  
*Qualifier: Must have at least one child listed*
5. Do any of your children within the 3-12 year age range actively use Voice Assistants (such as Siri, Amazon Alexa, Google Assistant) on any device?\**Qualifier: Must answer yes*

### Parent Demographics

6. What state do you live in?

Alabama	Hawaii	Massachusetts	New Mexico	South Dakota
Alaska	Idaho	Michigan	New York	Tennessee
Arizona	Illinois	Minnesota	North Carolina	Texas
Arkansas	Indiana	Mississippi	North Dakota	Utah
California	Iowa	Missouri	Ohio	Vermont
Colorado	Kansas	Montana	Oklahoma	Virginia
Connecticut	Kentucky	Nebraska	Oregon	Washington
Delaware	Louisiana	Nevada	Pennsylvania	West Virginia
Florida	Maine	New Hampshire	Rhode Island	Wisconsin
Georgia	Maryland	New Jersey	South Carolina	Wyoming

7. What best describes your current gender identity?\*
- |                                                      |                              |
|------------------------------------------------------|------------------------------|
| Woman                                                | Other (please specify) _____ |
| Man                                                  | Prefer not to answer         |
| Nonbinary (e.g., genderqueer, gender non-conforming) |                              |
8. What best describes your current gender identity?\*
- |                                      |                                            |
|--------------------------------------|--------------------------------------------|
| No, I do not identify as transgender | I do not know what this question is asking |
| Yes, I do identify as transgender    | Prefer not to answer                       |
| I am not sure if I am transgender    |                                            |

9. What is your race/ethnicity? (check all that apply)

American Indian or Alaskan Native

Asian

Black or African American

Hispanic or Latino

Native Hawaiian or Other Pacific Islander

Middle Eastern or North African

White

Other (please specify) \_\_\_\_\_

Prefer not to answer

10. What is the highest degree of education one of your parents has obtained?

No degree

High school degree or GED

Associate's degree

Bachelor's degree

Master's degree

PhD/MD/JD or other advanced degree

I'm not sure

11. What is your current household yearly income?

Less than \$50,000

\$50,000 - \$99,999

\$100,000 - \$149,999

\$150,000 - \$199,999

\$200,000 - \$249,999

\$250,000 or more

Prefer not to answer

12. What is your marital status?

Married

Single (never married)

Living with a partner

Divorced

Separated

Widowed

Prefer not to answer

13. Do you share the custody of your children with anyone who does not live with you?

Yes No Prefer not to answer

14. What percent of the time do they live with you?

Open-ended \_\_\_\_\_

### Child Demographics

15. Please indicate the age of the child that interacts most with Voice Assistants:\*

3 4 5 6 7 8 9 10 11 12

16. What type of school does your child attend?\*

Public school

Private school (secular/non-religious)

Private school (parochial/religious)

Homeschool

Other (please specify) \_\_\_\_\_

17. What grade (grade equivalent) is your child in?

Pre-school/Pre-K

1st grade

3rd grade

5th grade

7th grade

Kindergarten

2nd grade

4th grade

6th grade

8th grade

**18. What is your child’s race/ethnicity? (check all that apply)**

- American Indian or Alaskan Native
- Asian
- Black or African American
- Hispanic or Latino
- Native Hawaiian or Other Pacific Islander

- Middle Eastern or North African
- White
- Other (write-in)
- Prefer not to answer

**19. What is your child’s current gender identity?**

- Girl
- Boy
- Nonbinary (e.g., genderqueer, gender non-conforming)

- Other (please specify) \_\_\_\_\_
- Prefer not to answer

**20. Does your child identify as transgender?**

- No, they do not identify as transgender
- Yes, they do identify as transgender
- I am not sure if they are transgender

- I do not know what this question is asking
- Prefer not to answer

**21. Has your child ever been diagnosed with any of the following? (please select all that apply)**

- ADHD
- Depression
- Anxiety
- Learning disabilities (other than ADHD)

- Autism Spectrum Disorder
- None of the above
- Prefer not to answer

## Family Device Access

**22. Which of the following devices with Voice Assistant capabilities do you currently have in your home?**

	There is one in my home	There is not one in my home
Smartphone (e.g., iPhone, Android)		
Smart Speaker (e.g., Amazon Echo, Google Nest, Apple HomePod)		
Smartwatch (e.g., Apple Watch, Samsung Galaxy Watch)		
Tablet (e.g., iPad, Amazon Fire)		
Laptop (e.g., Chromebook, MacBook Air)		
Desktop Computer (e.g., Dell, iMac)		
SmartTV (e.g., LG with ThinQ AI, Samsung with Bixby, Fire Stick with voice remote)		

23. Which of the following devices does YOUR CHILD own or have access to? For each device, please specify if your child owns it, has access to it but does not own it, or does not have access. Remember to think about the child who is between the ages of 3-12 and uses Voice Assistants.

	Owns	Has access, but does not own	No access
Smartphone (e.g., iPhone, Android)			
Smart Speaker (e.g., Amazon Echo, Google Nest, Apple HomePod)			
Smartwatch (e.g., Apple Watch, Samsung Galaxy Watch)			
Tablet (e.g., iPad, Amazon Fire)			
Laptop (e.g., Chromebook, MacBook Air)			
Desktop Computer (e.g., Dell, iMac)			
SmartTV (e.g., LG with ThinQ AI, Samsung with Bixby, Fire Stick with voice remote)			

## Parent and Child Interactions with Voice Assistants

24. Over the last 30 days, how often have you interacted with a Voice Assistant on the following devices:

	Not at all	A few times a month or less	Once a week	A few times a week	Once a day	More than once a day
Smartphone (e.g., iPhone, Android)						
Smart Speaker (e.g., Amazon Echo, Google Nest, Apple HomePod)						
Smartwatch (e.g., Apple Watch, Samsung Galaxy Watch)						
Tablet (e.g., iPad, Amazon Fire)						
Laptop (e.g., Chromebook, MacBook Air)						
Desktop Computer (e.g., Dell, iMac)						
SmartTV (e.g., LG with ThinQ AI, Samsung with Bixby, Fire Stick with voice remote)						

25. How frequently do you use Voice Assistants for the following tasks?

	Not at all	A few times a month or less	Once a week	A few times a week	Once a day	More than once a day
Call someone						
Message someone						
Set reminders, timers, or alarms						
Control smart home devices (e.g. lights, thermostat)						
Check weather forecasts, sports scores, news updates						
Inquire about time, date, calendar events						
Seek factual information (e.g., business locations/ hours, movie times)						
Ask for or look up parenting information/advice						
Schedule calendar events or activities						
Help solve family disagreements or conflict (e.g., settle debates)						
Help make choices or decisions for your family						
Make announcements or leave messages for your family						

26. Over the last 30 days, how often has your child interacted with a Voice Assistant on the following devices:

	Not at all	A few times a month or less	Once a week	A few times a week	Once a day	More than once a day
Smartphone (e.g., iPhone, Android)						
Smart Speaker (e.g., Amazon Echo, Google Nest, Apple HomePod)						
Smartwatch (e.g., Apple Watch, Samsung Galaxy Watch)						
Tablet (e.g., iPad, Amazon Fire)						
Laptop (e.g., Chromebook, MacBook Air)						
Desktop Computer (e.g., Dell, iMac)						
SmartTV (e.g., LG with ThinQ AI, Samsung with Bixby, Fire Stick with voice remote)						

27. Thinking about all the devices your child uses, which of the following Voice Assistants has your child EVER interacted with? We're interested in the Voice Assistant regardless of the device.

Google Assistant                      Bixby  
 Alexa                                      Other (please specify) \_\_\_\_\_  
 Siri

28. Which Voice Assistant does your child interact with the most?

(Please select one or specify any other Voice Assistant not listed here).

Google Assistant                      Bixby  
 Alexa                                      Other (please specify) \_\_\_\_\_  
 Siri

29. How frequently does your child use Voice Assistants for the following tasks?

	Not at all	A few times a month or less	Once a week	A few times a week	Once a day	More than once a day
Call someone						
Message someone						
Set reminders, timers, or alarms						
Control smart home devices (e.g. lights, thermostat)						
Check weather forecasts, sports scores, news updates						
Inquire about time, date, calendar events						
Seek factual information (e.g., business locations/ hours, movie times)						



30. How often does your child use Voice Assistants for the following purposes?

	Not at all	A few times a month or less	Once a week	A few times a week	Once a day	More than once a day
Get help with homework or other educational activities						
Ask questions driven by curiosity (e.g., "Why is the sky blue?")						
Listen to music						
Play games, take quizzes, or do other activities for fun						
Tell jokes or riddles						
Listen to stories						

31. How frequently does your child interact with Voice Assistants in each of the following ways?

	Not at all	A few times a month or less	Once a week	A few times a week	Once a day	More than once a day
Talk about their personal experiences (e.g., details about their day, feelings, experiences) with the Voice Assistant						
Include the Voice Assistant in their imaginative play (e.g. treating it as a character or playmate and/or asking it questions during their play)						
Ask the VoiceAssistant personal or hypothetical questions (e.g., "Alexa, do you have a best friend?")						
Expressing emotions toward the Voice Assistant (e.g., saying "I like you!" or "You are stupid")						

32. This is an attention check question. Please select C as the answer choice.\*

A C D B

## Parental Attitudes toward Voice Assistants

33. To what extent do you think your child's use of Voice Assistants improves or worsens your child's learning and education in the following ways?

	Worsens a lot	Worsens a little	Does not worsen nor improve	Improves a little	Improves a lot
Access to accurate and factual information					
Focus on their homework and educational activities					
Creative problem-solving					
Risks of exposure to inaccurate or misleading information					

34. To what extent do you think your child's use of Voice Assistants improves or worsens your child's social skills in the following ways?

	Worsens a lot	Worsens a little	Does not worsen nor improve	Improves a little	Improves a lot
Ability to connect with others					
Kindness and civility towards others					
Understanding and expression of emotions					

35. When talking to a Voice Assistant, how often does your child use polite language like "please" and "thank you?"

Never                      Rarely                      Sometimes                      Often                      Always

36. When referring to a Voice Assistant, does your child use a person pronoun, like "he/she" or does your child say "it"?you?"

Always uses a person pronouns                      Usually says "it"  
 Usually uses a person pronoun                      Always says "it"  
 Uses a person pronoun and "it" about the same amount of time

37. How much do you agree or disagree with the following statements about Voice Assistants?  
 Voice Assistants can...

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Act as a companion for your child					
Help reduce your child's feelings of loneliness					
Substitute for human interaction for your child					

38. How much do you think the use of Voice Assistants improves or worsens each of the following:

	Worsens a lot	Worsens a little	Does not worsen nor improve	Improves a little	Improves a lot
Your family's interaction and communication					
Your family's shared experiences, like listening to the same music and playing interactive games					
Your family's traditional family bonding activities (e.g., eating a meal or watching a movie together)					
Your child's ability to be independent (e.g., going to bed on their own, controlling devices)					

39. How concerned are you about the following issues related to your child's use of Voice Assistants:

	Not at all concerned	Slightly concerned	Moderately concerned	Very concerned	Extremely concerned
Data privacy and personal information security					
Exposure to strangers or harmful individuals					
Exposure to advertising or marketing					
Surveillance and monitoring of behavior					
The amount of time your child spends using Voice Assistants					

40. How much do you agree with each of the following statements about Voice Assistants?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Not Applicable
Voice Assistants generally behave in a predictable way.						
Voice Assistants have some bad intentions.						
I would feel comfortable having a personal conversation with a Voice Assistant.						
Voice Assistants' behaviors freak me out.						
Voice Assistants are trying to get my private information.						

## Child Perceptions of Voice Assistants

41. To what extent do you agree with the following statements about your child's experience with Voice Assistants?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
My child finds it straightforward to use a Voice Assistant.					
My child finds it enjoyable to use a Voice Assistant.					
It is clear and easy for my child to understand how to use a Voice Assistant.					

42. To what extent do you agree with the following statements about your child's perception of the Voice Assistant that they use the most?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
My child believes that the Voice Assistant has thoughts and emotions.					
My child believes that the Voice Assistant is a real person.					
The Voice Assistant makes my child feel comfortable.					
My child believes the Voice Assistant has a gender.					

## Parental Involvement with Child's Use of Voice Assistants

43. There are many ways that you may play a role in your child's use of Voice Assistants. Have you ever done each of the following?

	Yes	No	I don't know/ not applicable
Limit the amount of time your child uses Voice Assistants			
Set up a child account on the Voice Assistant for your child			
Talk with your child about how they use Voice Assistants			
Limit the topics or questions your child can talk about with the Voice Assistant			
Discuss the accuracy of information from Voice Assistants			

44. How often do you use Voice Assistants together with your child?

- Not at all
- Once a week
- Once a day
- A few times a month or less
- A few times a week
- More than once a day

45. When you use a Voice Assistant with your child, how often do you do each of the following?

	Never	Rarely	Sometimes	Often	Always
Listen to music or stories					
Play games					
Seek information/ask it questions					
Set routines or reminders					

## Family Relationships and Voice Assistants

46. In the last 30 days, how often did you, your child, or other people in your household have disagreements about the use of Voice Assistants?

- Not at all
- Once a week
- Once a day
- Once a month or less frequently
- A few times a week
- More than once a day

47. To what extent do you agree with each of the following statements about your family?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
<i>“In our family we really help and support each other.”</i>					
<i>“In our family we spend a lot of time doing things together at home.”</i>					
<i>“In our family we really get along well with each other.”</i>					

## Generative AI

48. How familiar are you with Generative AI, such as Chat GPT?

- Not at all familiar
  - Slightly familiar
  - Moderately familiar
  - Very familiar
  - Extremely familiar
- “I have never heard of Generative AI.”*    
 *“I have heard of Generative AI but don’t know much about it.”*    
 *“I have a basic understanding of what Generative AI is and what it can do.”*    
 *“I have a good understanding of Generative AI and its general capabilities.”*    
 *“I am very knowledgeable about Generative AI, including its specific features and applications.”*

49. How often do you use Generative AI, such as Chat GPT?

Rarely “I use Generative AI occasionally, but it is not a regular activity.”	Sometimes “I use Generative AI periodically for specific purposes or situations.”	Frequently “I use Generative AI regularly, but it is not a daily activity.”	Daily “I use Generative AI on a daily basis.”	Multiple times a day “I use Generative AI several times throughout the day.”	I don’t know if I have used Generative AI	Never “I have never heard of Generative AI.”
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50. This is an attention check question. Please select ‘often.’

Never Rarely Sometimes Often Always

51. How often has your child used a Generative AI, such as Chat GPT?

Never “My child has never used Generative AI.”	Rarely “My child uses Generative AI occasionally, but it is not a regular activity.”	Sometimes “My child uses Generative AI periodically for specific purposes or situations.”	Frequently “My child uses Generative AI regularly, but it is not a daily activity.”	Daily “My child uses Generative AI on a daily basis.”	Multiple times a day “My child uses Generative AI several times throughout the day.”	I don’t know if my child has used Generative AI.
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52. Which of the following have YOU used Generative AI to do (select all that apply)

Creative activities (e.g. generating images, generating creative writing like poems or songs)	Seeking information/advice (e.g. using as search engine, getting medical, legal or other professional information)	Making tasks easier (e.g. drafting emails/texts, summarizing readings, help with work/homework)
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53. Which of the following do you know YOUR CHILD used Generative AI to do (select all that apply)

Creative activities (e.g. generating images, generating creative writing like poems or songs)	Seeking information/advice (e.g. using as search engine, getting medical, legal or other professional information)	Making tasks easier (e.g. drafting emails/texts, summarizing readings, help with work/homework)
--------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------

54. How much do you agree with each of the following statements about Generative AI, like ChatGPT?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Generative AI generally behaves in a predictable way.					
I believe Generative AI has some bad intentions.					
I would feel comfortable having a personal conversation with Generative AI.					
Generative AI's behaviors freak me out.					
I have a bad feeling that Generative AI is trying to get my private information.					

55. As your child grows up, what type of impact do you believe that Generative AI (e.g., ChatGPT) will have on their...?

	Very negative	Negative	Neither negative nor positive	Positive	Very positive
Education/schooling					
Curiosity/desire to learn					
Imagination/creativity					
Critical thinking skills (e.g., problem-solving, evaluating information)					
Social skills					

56. How much do you agree with the following statements about the information that Generative AI produces?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
It is accurate and factual.					
It is credible.					
It is trustworthy.					
It is useful.					
It is biased.					

## How We Create Impact

The Digital Wellness Lab conducts, translates, and distributes rigorous research on the positive and negative effects of technology and interactive media use on young people to inform our progress towards positive health and development for every child, teen, and young adult.

Through our research, we seek to:

**Advance digital wellness focused design, delivery, and marketing practices in the tech industry** by working to understand their current and future challenges and to translate our research outcomes into actionable insights to share with company decision-makers to enable healthy interactive media experiences for youth.

**Embed digital wellness in healthcare strategies** by providing evidence-based knowledge and tools designed to move towards a more standardized understanding of, and approach to digital well-being, and to empower clinicians in their ability to help young people and their families build and maintain healthy behaviors.

Our work is supported in part by unrestricted donations from technology, entertainment, and healthcare companies, however we do not evaluate, endorse, or give preference to any products or platforms.

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**Boston Children's**  
Digital Wellness Lab

**The Digital Wellness Lab at Boston Children's Hospital and Harvard Medical School seeks to understand and promote positive and healthy digital media experiences for young people, from birth through young adulthood.**

The Digital Wellness Lab is made up of a dynamic and collaborative team of experts and thought leaders from health sciences, tech, academics and entertainment. We are ever-evolving and welcome others to join us on our mission.

**BECOME A SUPPORTER**

The Digital Wellness Lab convenes supporters from healthcare, technology, media, and entertainment to deepen our understanding and address the future of young people's healthy engagement with media and technology. If your organization is interested in becoming involved as a financial supporter, please email us at [dwl@childrens.harvard.edu](mailto:dwl@childrens.harvard.edu)

For more information about our work, please contact Cori Stott, Executive Director, at [dwl@childrens.harvard.edu](mailto:dwl@childrens.harvard.edu)