

Using Attention-Based Goals to Guide Pediatric Outpatient Design

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Abstract

A trip to the doctor can be a stressful experience for children. Patient experience can be improved when healthcare settings are designed to support children's attentional states of engagement and distraction. This essay describes when to use engagement and distraction, and how these states can be supported by clinic designers, clinicians, staff, and child life specialists through aligning environmental design and technology interventions in the outpatient pediatric healthcare setting throughout the patient's healthcare journey.

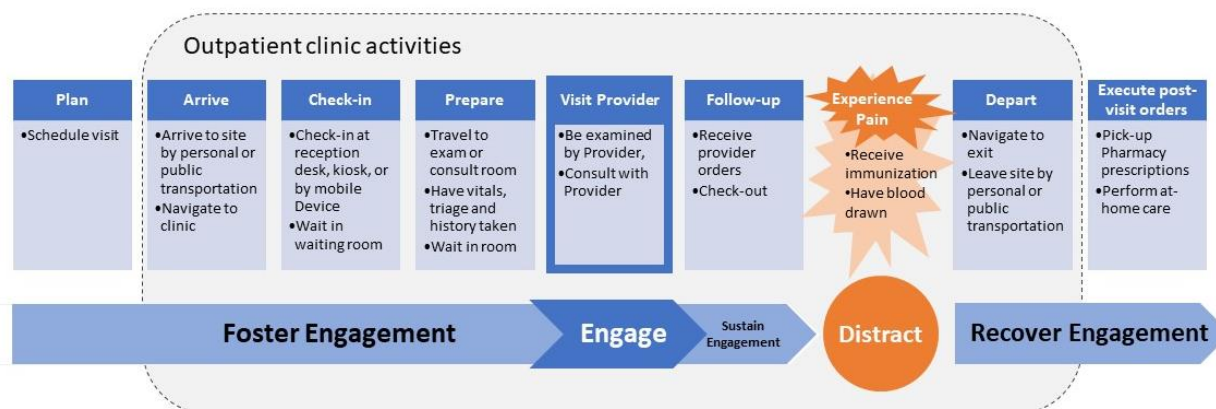
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Introduction

In designing the pediatric healthcare outpatient experience, there is a general aim to create a child-friendly environment to support the physical and psychological needs of the patient. Design professionals such as architects, interior designers, and design trade partners often include “positive distractions” (Ulrich, 1991) in pediatric healthcare settings to support patient experience (Jiang, 2020). The intention behind using positive distractions is to shift focus away from negative internal thoughts and external triggers within the physical healthcare setting. It has been suggested that positive distractions can mitigate stress particularly during long waits and inpatient stays (McCuskey Shepley, 2006) when boredom and negative rumination can occur. In short stay experiences such as outpatient visits, *distraction* in general can be supportive in some aspects of clinical care such as pain management. However, distraction can be counter-productive when the aim is to *engage* patients by helping focus a patient’s attention on the clinical encounter, not divert attention away from it. Understanding these distinct attentional aims—engagement and distraction—and aligning these aims with steps along the healthcare journey can help professionals who are involved in designing patient experience set appropriate goals and align interventions with those goals.

Outpatient clinic patient flows are organized around patient-provider encounters. These encounters, or visits, typically occur in examination or consult rooms for the purpose of evaluation and clinical decision making. Results from a survey of pediatricians in the United States found that most providers spend approximately 9–13 minutes with each patient during routine care visits (Grisham, 2017). However, time spent with the provider constitutes only a fraction of the entire patient journey. A routine pediatric outpatient journey encompasses additional steps before and after the patient-provider encounter (Figure 1), such as: plan and schedule the visit (offsite), arrive at the site, check-in, wait, move to the exam or consult room, have vitals taken and undergo triage, wait again, visit with the healthcare provider, check out, navigate to the exit, depart from the site, and execute post-visit orders which may include a pharmacy visit, and at-home care responsibilities. Painful procedures, such as immunizations and laboratory blood draws, which can benefit from supporting patient distraction, may occur at other points in the journey. The number and sequencing of these painful events within the patient journey should be carefully considered because of their potential to disrupt a patient’s target attentional state.

Figure 1. Patient and parent/caregiver outpatient clinic journey steps, and aligned attention mechanisms



Specialty visits and complex cases often require additional steps, transitions, hand-offs, locations, and clinic time. Although it falls outside the scope of this paper, designing the journey to eliminate wait, reduce steps, and minimize transitions should be prioritized. In cases where these procedural steps are unavoidable, knowing when and how to support attentional goals can improve patient experience.

Patient Engagement

There is great benefit to patients of all ages in being engaged in their healthcare journey. The World Health Organization (2016) recommends to health systems worldwide that individuals and families be empowered to be active participants in their care. The Institute of Medicine (2001) advocates for patient involvement in decision making to improve quality of care, and the United Nations Convention on the Rights of the Child (2003) mandates that children have the right to participate in decision making. Patient engagement and patient activation have been correlated with increased self-confidence in pediatric patients (Jeremic, 2016), better health outcomes, better patient experience, and lower costs (Greene et al., 2015; Hibbard & Greene, 2013).

The outpatient clinic setting offers an opportunity for patients to engage with healthcare providers, gain health literacy, and practice health ownership behaviors during clinical encounters. However, a parent/caregiver's and clinician's willingness and ability to embrace and promote engagement during a clinical encounter can be influenced by organizational culture as well as individual differences. For example, adults may restrict children's engagement in an effort to protect them from difficult information and decision-making (Coyne & Harder, 2011). A clinician's lack of motivation to promote patient engagement may be the result of a "desire to maintain control, a lack of time, personal beliefs, the type of [patient] illness, and training in patient-caregiver relationships" (Longtin et al., 2010, p. 53). Explaining a procedure to a patient might take too much time, or there may be an assumption that the patient is not capable of understanding, especially in the case of young

pediatric patients or patients with developmental disability. Yet, for any ability, even babies, there is a level in which patients can engage. Long-term health gains from engaging patients should outweigh short-term staff efficiency goals, and this should be an organizational-level priority for health systems. Impacts of low health literacy include more and longer hospital stays, and higher costs (Vernon et al., 2007; Mahadevan, 2013). It has been suggested that engaging patients at their level shows respect, increases a patient's sense of dignity, and creates a participatory partnership with the provider increasing communication and trust (Kovacs Burns et al., 2014). In direct patient care, engagement allows patients, parents/caregivers, and healthcare providers to participate in shared decision making (Carman et al., 2013). While engagement strategies will vary by age and ability, clinical encounters can offer a learning opportunity to engage even the youngest patients. For medical procedures, simply knowing what to expect in an unfamiliar setting with strange equipment can be empowering because it reduces fear of the unknown, and eliminates associated anxiety for the patient, parent/caregiver, and clinician (Armfield & Heaton, 2013).

Attention

A first step to supporting patient engagement is understanding how engagement maps to mechanisms of attention. While attention is not a firmly defined construct, a leading concept describes attention as selective information processing (Oberauer, 2019). In this framework, information processing may be driven by voluntary or involuntary attention. Voluntary attention is an internally motivated and goal-oriented allocation of attention resources. Historically, voluntary attention has been linked with the cognitive effort required to direct attention to a stimuli (James, 1892). The cognitive effort required to sustain attention varies based on the developmentally dependent task difficulty (for example, the complexity of the health information being discussed relative to the age of the patient) as well as the degree, quality, and location of any competing or task-relevant perceptual and sensory stimuli in the environment (Stevenson et al., 2018). Focusing on a conversation with a clinician and simultaneously tuning out other stimuli in the environment as well as internal thoughts is an example of utilizing voluntary attention. In contrast, involuntary attention is driven by external stimulation as when attention is captured by a stimulus in the environment (R. Cohen, 2018; Shiffrin & Schneider, 1977). Shifting attention to a phone ringing during a conversation with a clinician is an example of utilizing involuntary attention. In this case, the attentional shift to the phone ringing would be an unwelcome interruption to sustaining attention on the clinician conversation.

Task-irrelevant stimuli and unwelcome distractions from the environment, such as a phone ringing, require cognitive effort to inhibit a redirection of attention (Diamond, 2013). Inhibition and attention are closely linked with working memory. Working memory includes "the mechanisms and processes that hold the mental representations currently most needed for an ongoing cognitive task available for processing" (Oberauer, 2019, p. 1). For pediatric patients, neural mechanisms associated with attention, inhibition, and working memory develop slowly over a child's first five years (Garon et al., 2008), not reaching maturity until early adulthood; this limits a child's ability to attend, inhibit, and engage working

memory. Thus, it can be assumed that the younger the pediatric patient is, the more they may be prone to distraction and to decreased “interference control,” or the ability to free behavior from being controlled by the immediate environment (Brocki & Bohlin, 2004). Individual differences in working memory capacity also impact a person’s ability to filter out distractions (Vogel et al., 2005), and how long it takes to disengage from distractions (Fukuda & Vogel, 2011). Thus, given that pediatric patients may experience greater challenges focusing attention and inhibiting distraction, efforts to externally support these mechanisms should be considered.

For routine outpatient visits, the climactic point at which healthcare decision making occurs is during the patient-healthcare provider encounter in the exam or consult room. It is this point where attention is most important. The design of the space where engagement occurs may impact attention and the cognitive effort required to sustain it and foster engagement. A recent review found modest evidence that the environment may moderate engagement (Bosch & Lorusso, 2019). For example, exam rooms designed so healthcare providers are at eye level with patients and parent/caregivers promote a more equitable and engaged dialogue compared to settings where a provider stands above a patient, or behind a computer screen (Orloski et al., 2019). Further, to support learning in school applications, it has been suggested to “provide information visually,” and “monitor noise levels to avoid competing distractions” (Kalbfleisch, 2021). By extension, to support patient-provider engagement in exam and consult rooms, task-relevant props can be used to direct and focus attention, and competing stimuli that can serve as distraction should be eliminated from the engagement space. Additionally, reviewing health information through verbal and visual communication, such as by using toy-like props and models to explain complex issues, sharing age-appropriate content on a large computer monitor, or drawing on a white board may facilitate attentional bias by directing visual and auditory attention to the content.

Having access to nature in the outpatient setting may also increase attention and engagement. There is robust evidence pointing to benefits of nature on health dimensions including improved attention, cognitive functioning, reduced stress, and improved mood (Kuo, 2015). Research also suggests children’s contact with nature promotes physical and psychological health (Chawla, 2015), including benefits to children diagnosed with attention deficits who experienced improved concentration following nature walking (Taylor & Kuo, 2009). A review of nature’s impact on attentional processes showed that exposure to real-world (non-virtual) nature supported focused attention and inhibition, as well as working memory (Stevenson et al., 2018). Another study showed negative emotions were reduced and positive emotions increased during nature therapy (Oh et al., 2020). Such evidence inspired Boulder Community Health in Boulder, Colorado, USA to develop a program that takes advantage of nature benefits during clinical visits by offering patients behavioral healthcare appointments in nature settings, holding therapy sessions outdoors in public natural spaces around the city (Boulder Community Health, 2022).

Patient engagement can be extended to related activities and spaces leading up to, and following, the patient–healthcare provider visit. For example, one pediatric outpatient clinic developed a playful wayfinding game using environmental graphics to help patients navigate to their assigned exam room upon arrival to the clinic, instead of being escorted by a medical assistant or clinic staff (Hastings, 2019). Such problem-solving based tasks may inhibit stress, and because it is task-relevant to the upcoming clinical encounter, may also prepare the patient to be more engaged during the visit. Activities that shift health data to the patient, thereby increasing a patient’s health status awareness, health literacy, and sense of health ownership and responsibility can increase engagement from an early age. For instance, patients can take their own vital measurements of blood pressure, pulse and weight at check-in through a clinic-based kiosk instead of being passive during the process as these measurements are taken by medical assistants at a vitals station in a semi-private corridor. The digital therapeutic platform Xploro provides another example. Intended to be used before a healthcare visit, Xploro is specifically designed to deliver health information to young patients to empower and engage them in their own health journey using augmented reality, gameplay, and artificial intelligence (Xploro, 2020). A study found that children who interacted with Xploro before a clinical procedure reported having improved perceptions of procedural knowledge and involvement, and had significantly lower levels of anxiety before the procedure than those who had not interacted with the digital platform (Bray et al., 2020).

Digital game researchers have encouraged pediatricians to participate in developing more health-related media and games given their effectiveness in addressing health topics and populations (Shifrin et al., 2015). A digital intervention like Xploro not only aims to increase health literacy, but also dispel anxiety associated with the unknown by instilling a sense of predictability. Helping patients predict what to expect through engagement can be supported by setting expectations through simulations and play prior to procedures. For children, engagement might include overcoming fears about strange equipment, unfamiliar faces, and darkness. While it may take extra time to explain to a pediatric patient what is happening, benefits include a lower risk of adverse effects and improved long-term healthcare engagement (Lerwick, 2016), as well as more effective healthcare visits. In imaging, for example, reducing patients’ stress has been found to help reduce their motion, resulting in more accurate images (Powell et al., 2015), more efficient and therefore shorter appointments (Durand et al., 2015; Etzel-Hardman et al., 2009), reduced use of sedation and therefore fewer adverse effects (Etzel-Hardman et al., 2009), improved patient safety and less error and therefore less need for re-imaging and additional radiation exposure (Powell et al., 2015), and improved patient and parent/caregiver satisfaction (Etzel-Hardman et al., 2009). In a radiology clinic, giving pediatric patients the ability to act out what they will be experiencing with toys or stuffed animals in the waiting room can help them prepare for the imaging procedure and better anticipate what is an unfamiliar sensory experience. A study evaluating role-playing protocols using the Philips Kitten Scanner, a toy-scale version of an MRI scanner where children can “scan” stuffed animals, showed a 30% reduction in sedation needs among participating children (Cavarocchi et al., 2019). The use of full-size mock scanners ranging from

an MRI simulator to a simple toy tunnel (Barnea-Goraly et al., 2014; Kalbfleisch, 2010), VR simulations (Brown et al., 2018), and even instructional videos (Ahlander et al., 2018) have been shown to decrease patient anxiety and improve image quality.

Stress and anxiety are often an impediment to engagement; thus, during periods of wait and transition, finding opportunities to reduce stress and nurture calm can support enhanced engagement at other critical points in the patient journey. Researchers have linked exposure to nature stimuli with a reduction in stress (Thompson et al., 2012) suggesting that interaction with nature may mediate the effects of stress and enhance coping mechanisms in the presence of distractions. Others have suggested that nature experiences may restore working memory (Kaplan, 1995; Kaplan & Berman, 2010; Stevenson et al., 2018) following attentional fatigue. Requiring a patient to be engaged for a long period of time during a healthcare visit can be cognitively taxing. Taking a break to rest and recover from attentional demands in the presence of nature may be one way to restore attention and focus. Physical moments of pause in the healthcare setting create places that allow a person to process cognitive information. Nature-based interventions such as natural playgrounds, gardens, and courtyards that invite dynamic interaction with nature are preferred (Whitehouse et al., 2001) and afford deeper engagement with nature and thereby more benefits than passive exposure (Chawla, 2022). However, biophilic, or nature-based, design elements such as views to nature from a window, and even large, realistic nature-themed artwork can be introduced into transition spaces to help patients and parent/caregivers reduce stress, restore attention, guide internal processing, and better cope with negative emotions.

Designing for attention and stress reduction benefits afforded by nature in healthcare settings is not only supportive for patients and parents/caregivers, but also can help offset fatigue and burnout for healthcare workers. Given the intense and often sustained directed attentional demands during clinical encounters and procedures, a supportive break space with exposure to, or opportunities for immersion in, nature may reduce stress and restore attention and focus for staff.

Distraction

A key goal for routine pediatric outpatient visits is to support engagement throughout the healthcare journey. However, for certain types of painful and anxiety-inducing events, distraction becomes an important tool. While engagement benefits from interventions which focus directed voluntary attention, distraction aims to redirect attention to an external source. To meet the definition of a true distraction, stimuli must be salient enough to capture attention. Distractions are beneficial in healthcare setting when they are used to decrease pain perception and to disrupt feelings of anxiety. In healthcare settings, there should be clear intent on whether patients would benefit from removing irrelevant distractions in order to more readily focus their attention and promote engagement, or whether distractions should be intentionally interjected into the healthcare setting to divert a child's attention away from the clinical experience or internally motivated negative thoughts.

The term “positive distraction” was first described by design researcher Roger Ulrich as “an environmental feature or element that elicits positive feelings, holds attention and interest without taxing or stressing the individual, and therefore may block or reduce worrisome thoughts” (1991, p. 102). In contrast to positive distractions, Ulrich described “negative distractions” as “environmental elements that assert their presence, are difficult to ignore, and are stressful” (1991, p. 105).

Ulrich called for more research to examine the impact of television in particular as a potential negative distraction (Ulrich, 1991). Nonetheless, over the preceding decades, televisions and mobile devices have become ubiquitous during periods of waiting during healthcare visits. Technology-based distractions can be an obstacle to patient engagement because they so powerfully consume attention. For example, if a patient is watching a television program or playing on a mobile device in the waiting room, it can be hard for a patient—no matter what age—to shift attention away from the technology source and transition to fully participating in the next stop on their healthcare journey.

Design professionals such as architects and interior designers often interpret *positive distraction* to simply mean *distraction* during a healthcare visit. The danger is that failing to recognize the *negative distraction* counterpart which Ulrich advised against can be counterproductive to fostering engagement during healthcare visits. Nonetheless, often healthcare providers and designers promote distractions for the very reason that they divert the patient’s attention from what is happening during the healthcare visit. This practice is especially used with pediatric patients who have less control over emotional and behavioral responses to unknown and scary situations. Some clinicians may use external distractions to capture the attention of the patient in an attempt to avoid emotional and behavioral reactions that may result in medical errors, safety risks to patients and staff, and wasted staff time. During pediatric clinical encounters, videos and mobile apps are often used because of their power to fully consume a child’s attention so the clinician can focus on a procedure or conversation with a parent/caregiver. Such digital distractions result in a missed opportunity to engage with the patient and to support children in their right to participate in decision making (United Nations Convention on the Rights of the Child, 2003). Moreover, using digital distractions in the healthcare environment results in sending a mixed message to patients and parents/caregivers by implicitly suggesting it is okay to use digital technology within the healthcare clinic, while at the same time advising that it be limited in use at home. The American Academy of Pediatrics Council on Media recommends “avoiding using media as the only way to calm your child” (2016, p. 4) due to concern about how it impacts a child’s ability to develop their own emotional regulation.

Nonetheless, distractions that are cognitively engaging, including technology interventions, can be useful for mitigating stress during long periods of waiting when negative rumination and stress can set in. Persons experiencing acute stress have shown impairments in engaging directed attention, and in turn are more susceptible to environmental interference on attention (Sänger et al., 2014). In classroom settings, it has been suggested that teachers can guide higher-level

thinking as a means to disrupt stress using different strategies including task-focused problem-solving (Kalbfleisch, 2021). Similarly, a problem-solving task could be presented to a pediatric patient while they are waiting. Moreover, providing the child with a clinically relevant task-based distraction may require less attentional task-shifting on the part of the patient when they transition from the waiting state to the clinical encounter, compared with other unrelated but consuming distractions.

A study examining the use of distractions while waiting at the hospital suggested the value of distraction is its potential to transform expectations for healthcare visits from something that is boring and unpleasant and incites resistance, to something that is perceived as an attraction (McLaughlan et al., 2019). This particular study evaluated pediatric patient reactions to an aquarium and animal enclosure, among other design interventions, in the hospital waiting area and suggested that such interventions potentially foster a “desire to return” to the hospital versus a feeling of aversion (McLaughlan et al., 2019). More research is needed on the use of attention-consuming, yet task-irrelevant, distractions in short-term outpatient waiting areas with expectation-based benefits weighed against potential impacts to a patient’s ability to subsequently task-shift and engage in the clinical encounter following waiting periods.

In the same way that such distractions are used to disrupt feelings of anxiety so too can they be used to divert attention resources from a pain response. Evidence suggests that distraction, in the form of a cognitively demanding task, can lower ratings of pain (Bantick et al., 2002; Petrovic et al., 2000) and is correlated with decreased activity in pain regions of the brain (Bantick et al., 2002; Bushnell et al., 2013) and spinal cord (Sprenger et al., 2012). Distraction engages the allocation of the brain’s finite attention resources to limit the extent a pain sensation is attended to (McRae et al., 2010). Thus, distraction interventions can be effective for both procedural and chronic pain management including pediatric and adult procedures such as: burn treatment, immunizations, needle procedures, cancer care, and venous access (Boerner et al., 2015; L. Cohen et al., 2013; Kwekkeboom, 2003). Alternatives such as pharmacological interventions or restraint vary in effectiveness, may have unwelcome side effects, and in the case of restraint specifically, can cause harmful psychological distress in children (Bukola & Paula, 2017). A review of distraction interventions in needle procedures for children and adolescents suggests interactive distractions may have slightly more efficacy in reducing pain perception over passive distractions (Birnie et al., 2014). While it seems that interactive, immersive and cognitively demanding qualities are key to designing the most effective environmental interventions for using distraction in pain management, additional research on the efficacy of environmental distraction interventions is needed.

“Virtual anesthesia” is a distraction technique currently being used to support pain management in pediatric patients who cannot undergo medical anesthesia. A meta-analysis found that the use of virtual reality is an effective distraction intervention to reduce pain and anxiety in children (Eijlers et al., 2019). One study even found that the implementation of virtual reality negated the need for anesthesia in

transnasal endoscopy in the evaluation and treatment of eosinophilic esophagitis, a procedure that previously required sedation (Nguyen et al., 2019). Virtual reality offers a non-opioid, non-sedating option for reducing pain and anxiety related to medical procedures and further research should be conducted to explore its full potential. Moreover, technology-based interventions such as virtual reality and digital projections offer a means to provide distraction while maintaining a sterile environment (Marques da Rosa, 2021).

Conclusion

When developing goals to enhance patient experience, healthcare providers and designers should consider how best to support a patient at each segment in their healthcare journey, as well as how design and experience decisions may impact a patient's downstream attentional states following activities in which their engagement is intentionally disrupted.

The answer to when to engage or distract comes with a situational understanding of the different activities that take place throughout the healthcare journey. For most aspects of a routine outpatient visit, fostering and sustaining engagement is the key priority: focusing and engaging attention can help pediatric patients decrease fears of the unknown, practice health ownership behaviors during clinical encounters, and improve their health literacy and health ownership. Providing exposure to or immersion in nature in the healthcare setting may help reduce the cognitive effort required for sustaining attention and may reduce stress. Distraction does have a place in the healthcare setting during events in which the aim is decreasing pain perception and supporting stress management, but distraction should not be promoted in settings where it might obstruct patient engagement.

High-level environmental and technological interventional strategies aligned with target engagement and distraction states for different segments of the patient journey are summarized in Table 1. However, to effectively provide systematic and evidence-based guidance on attention-based interventions for the pediatric population and its subgroups, including age and individual difference, more experimental research is needed. This call for research includes studies on attention mechanisms in the field of neuroscience, and translational research in clinical science and design research.

Table 1. Attention-based interventional strategies aligned with steps in a pediatric outpatient clinic visit

Attentional Aim: Engage	
Patient Journey Segment	Interventional Strategy
Arrive <ul style="list-style-type: none"> • Arrive to site by personal or public transportation • Navigate to clinic 	Reduce stress and anxiety to support attention mechanisms, e.g., through nature and biophilic interventions.
Check-in <ul style="list-style-type: none"> • Check-in at reception desk, kiosk, or by mobile device • Wait in waiting room 	<p>Foster engagement and health literacy in patients and parents/caregivers by offering kiosks for self-taking vital measurements of blood pressure, pulse and weight.</p> <p>Help patients predict what to expect through physical or virtual simulations and play opportunities prior to the actual clinical procedure.</p>
Prepare <ul style="list-style-type: none"> • Travel to exam or consult room • Have vitals, triage and history taken • Wait in exam or consult room 	Help patients reduce stress by offering situationally relevant problem-solving tasks, e.g., by gamifying wayfinding and allowing patients to self-navigate to their assigned exam destination using environmental graphics.
Be Examined by, and/or Consult with Healthcare Provider	<p>Help patients and parents/caregivers focus on the provider conversation by using task-relevant, toy-like props and models to direct and focus attention, especially when explaining complex issues. To direct visual and auditory attention, age-appropriate content can be shared on a large computer monitor, or by drawing on a white board.</p> <p>Eliminate competing stimuli which can serve as distraction from the encounter space.</p>
Attentional Aim: Distract	
Receive Immunizations	Divert attention resources from a pain response to decrease pain perception and disrupt feelings of anxiety using immersive, interactive and cognitively demanding interventions, e.g., by using technology-based games and age-appropriate video programming.

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