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Representations of ICT use in young children's television content broadcast in Israel

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Abstract

Very young children increasingly use information and communication technologies (ICTs) in their home and educational environments. The study examined representations of ICT use in children's television content, which is a central socialization agent for this audience. Based on cultivation theory, an in-depth qualitative content analysis of television series for young children aired in Israel was conducted. Findings indicate that ICTs are depicted in this content as largely positive, promoting community connectedness and problem resolution, and as effective innovations for the dissemination of information. At the same time, these portrayals ignore common ICTs in children's lives (e.g. social media) as well as social and emotional aspects associated with ICTs in the real world (e.g. entertainment use). Promising themes in the representations—such as the promotion of free, intuitive, and successful use of ICTS—are coupled with findings that question the realism and relevance of these representations for young audiences.

Keywords

Children's television, cultivation theory, ICTs, qualitative content analysis

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Today very young children, from birth to 6 years of age, grow up in an environment that is highly saturated with information and communication technologies (ICTs)—from television and video cameras to newer technologies and smartphones. In the United States, in 2017, nearly every household with preschool children had a television set and a mobile phone, more than two-thirds had a computer, more than half had a smartphone and Internet connection, almost a third had a robotic toy, and 10% included a game console; many young children have their own television and mobile devices (Kabali et al., 2015; Konca and Koksalan, 2017). In Israel, where the current study is situated, 30% of parents reported sitting their less than 1-year-old babies in front of the television set daily and many babies are already exposed to mobile technologies by that age (Israel National Council for the Child, 2018). Beyond their home exposure and use of ICTs, young children are also exposed to ICTs in educational settings. In recent years, early educational frameworks have increasingly been integrating computers, cameras, augmented reality books, and humanoid robots into their programs (Crompton et al., 2018; Roberts-Holmes, 2014).

As a result of such early and regular exposure to ICTs, by the age of 4, many children use ICTs without adult assistance and about a third do so while media multitasking. By age 6, children exhibit positive attitudes toward computers, display diverse computer skills, and are considered competent in their technological abilities, including using ICTs for play and information searches, using a mobile phone as a camera and so on (Kabali et al., 2015; OECD, 2019).

Children learn about ICTs from their everyday experiences with them, but other socialization agents can also play a role in children's understanding of ICTs—their uses, characteristics, and the norms and values associated with their use—and in the shaping of attitudes and future intentions toward their use. One important socialization agent is television content, to which young children are heavily exposed (ViacomCBS Global Insights, 2016). Children's regular and repeated exposure to the prevalent messages about ICTs depicted in shows that target this young audience, specifically, can shape the perceived reality of ICTs among these children, as explained by cultivation theory (Gerbner et al., 1994). This study thus examines the messages about ICTs presented in television series targeting young children, mapping the common ICTs, their uses and characteristics, and the themes that underlie their portrayals, from which children can learn about ICTs.

ICTs in children's lives: promises and challenges

For years, scholars have been debating the promises and downfalls of ICTs. Especially for young children, the accelerating presence of ICTs in their world has raised both hopes and heavy concerns. On the positive side, ICTs are thought to promote important values such as freedom and equality (Lauth, 2016), diversity, community, and civic participation (Balockait et al., 2008). The discussion of these values is couched in the perceived importance of preserving children's rights to participate in digital communication, to being informed and active citizens, including their right to freedom of self-expression in the digital space (Kaesling, 2021). Because many people associate ICTs with innovation, ICTs are highly valued in contemporary society and are considered necessary components of businesses and economies (Baregheh et al., 2009). As innovations, ICTs carry

with them the promise for newness, for providing important knowledge and improved solutions, and for creativity (e.g. Johannessen et al., 2001).

In the home, ICTs are thought to have the potential to unify the family through co-use. The interactivity of newer technologies has been found to support children's learning and self-regulation skills (Lawrence and Choe, 2021). Teachers report that children are digital natives who intuitively use ICTs (Roberts-Holmes, 2014). Studies of children's experiences in educational settings reflect largely positive outcomes, including a high motivation for learning with ICTs, emotional and cognitive involvement with ICTs, and enjoyment, enthusiasm, and durable happiness. The potential of ICTs to promote creative, imaginative, and collaborative uses by students in the classroom has also been noted (Abbott et al., 2001). Additional positive outcomes include children's increased perseverance and enhanced self-esteem. Team outcomes include improving patience in turn-taking and collaboration with others in the use of ICTs. It appears that young children enjoy interacting with and learning from ICTs and find them interesting, creative, fun, and even magical.

Some literature has focused on potential concerns associated with ICTs with regard to children. Early technological deterministic perspectives saw media technologies as threatening because they expose children to the backstage of adult life, to information about the world for which they may not be prepared, thus robbing them of their childhood (Meyrowitz, 1985; Postman, 1982). More recently, Balockaite et al. (2008) have suggested that ICTs may pose a threat to democracy as they offer new forms of control and surveillance of the citizenry, threaten people's privacy, enlarge the digital divide between "haves" and "have-nots," and may lead to information overload. Concern has been expressed that "today, many policy legislative and regulatory mechanisms do not adequately support and protect children online" (Third et al., 2019). Studies with parents, caregivers, and teachers reveal concerns about both the content and context of ICT use (Hiniker et al., 2016). Mobile use has been negatively associated with language development and the acquisition of self-regulation skills among children (Lawrence and Choe, 2021). The harm for children from exposure to inappropriate content online, harassment, violations of their privacy, and encouragement to engage in illegal activities has also been noted (Sharkins et al., 2016).

Moreover, the need for parents to set rules about their children's ICT use and enforce them is often a source of tension in the household. The role of parents' involvement as role models for and supervisors of appropriate and responsible ICT use is often noted (Huda et al., 2017). Concerns have been voiced about teachers' lack of time, training, knowledge, and support to use ICTs in a creative and meaningful way to innovate their pedagogy (Magen-Nagar and Firstater, 2019). Overall, it seems that the use of ICTs by children is controversial and, in extreme cases, concerns develop into moral panics about the digitization of childhood, the destabilization of familial relations, and the future effects on young children (Plowman et al., 2010).

ICT depictions in the media

One of the ways through which children can learn about the central ICTs in their lives, beyond personal experience, is through the media, and television, specifically. Television

serves as a central socializing agent for young children who watch an average of 2–3 hours of content daily, most on channels targeting this age group (Te'eni-Harari and Yadin, 2019). To date, few content analyses have assessed media depictions of ICTs. Some studies have examined the presentation of children as computer users in newspapers and magazines and have found mostly positive, optimistic representations of ICTs, as euphoric sites that emancipate and empower children (e.g. Rossler, 2001). Selwyn (2003) found that UK media in the 1980s and 1990s presented diverse discourses about the "child computer user," including children as natural, adult-like, and need-oriented ICT users and children as dangerous or victimized computer users. More recently, Shaw and Tan (2015) found that Taiwanese children's magazines depicted the child computer user as successfully using ICTs to satisfy important needs and to advance their knowledge and future economic prospects. These magazines did not emphasize the dangers of ICTs and there was little consideration of individual diversity and complexities of ICT use.

Research to date on ICT portrayals on television has focused on specific genres, content, or topics (e.g. gender and ICT use) (e.g. Gerding and Signorielli, 2014; Knupfer, 1998). Most investigations focused on adult-targeted content, such as fictional television shows (e.g. "Black Mirror," Thomas and Rajan, 2018) or science fiction films. In one of the rare content analyses of ICT depictions in US tween television shows, Gerding and Signorielli did not find gender differences in characters' handiness with technologies.

Theoretical framework: cultivation theory

Cultivation theory is a sociocultural framework that contends that exposure to television content inevitably involves recurring exposure to repeated and consistent messages which—in direct relation to the amount of exposure—are likely to shape the viewer's worldview (Gerbner et al., 1994; Shrum, 2017). Heavy television viewers are likely to grow to perceive central phenomena in ways similar to their representation in television content. Research has documented small but consistent and convergent support for these cultivation premises, confirming their validity (Romer et al., 2014).

Cultivation theory highlights television's story-telling function (Shrum, 2017), which makes the theory still relevant today, in the constantly changing media landscape in which children are "growing up and living in a cultural environment dominated by mediated mass communication" (Morgan et al., 2014: 679). The examination of the landscape of television content for young children is in line with the recent shift within cultivation research to examine more specific contexts of exposure (Potter, 2014).

Indeed, the notion that popular cultural texts can impact young children's social perceptions alongside real-life experiences has garnered research support in recent years. In examining the learning of language attitudes, Stamou et al. (2015) wrote that "given the fact that contemporary social life is "textually mediated," it is highly possible that many children shape their ideas about sociolinguistic diversity . . . based merely, or mostly, on what they receive from these texts" (p. 217). They found that 6-year-olds based their linguistic diversity awareness to a large extent on popular cartoon and children's television series.

Further support for the effect of fantastical child-oriented television depictions on children's perceptions of various phenomena has been documented. Alade et al. (2022)

found that the occupational schema of kindergarten and first grade pupils reflected learning from both real-life (e.g. personal experience, family influences) and mediated sources of information, including science, technology, engineering, and mathematics (STEM)-focused educational television shows, which tend to underrepresent and stereotype women and minority characters in scientific professions (Alade et al., 2021). Alade et al. (2022) found that repeated exposure to a single counter-stereotypical representation in such shows was not enough to over-ride children's stereotypes about STEM occupations. This finding supports the idea promoted by the current study that it is the repeated and regular exposure to themes portrayed in shows that contributes to children's social perceptions.

This study adds to previous investigations by examining contemporary televised entertainment content that is targeting very young children and of which they are likely to be regular viewers. The study adds to past research by delving deeper into such depictions and examining the presentation of norms associated with ICT use, including which and how ICTs are used, who uses ICTs and what characterizes them, and what are the depicted outcomes of such use.

Research questions

Within young children's television content,

RQ1: (a) What ICTs are represented?

(b) What uses of ICTs are represented?

(c) Who uses ICTs?

(d) What are the contexts of ICT use (e.g. solitary use vs co-use, location of use [e.g. school, home], and purpose of use [e.g. learning, entertainment, social interaction])?

RQ2: What are the themes associated with ICT use?

Method

To examine the presence and context of ICT use in children's television content, the authors used a broad and comprehensive sample of content from eight Israeli television channels (Baby, Luli, Hop, Disney Junior, Nick Junior, Junior, JimJam, and the Israeli Educational Television). These channels defined their target audiences as early childhood (including at least some of the range from birth to 6 years of age) and constituted the entire population of television channels for this age group at the time of sampling. The analyzed content within these channels was randomly sampled to represent the broadcast schedule over a period of 1 month (January 2017).[1] Eight hours of content were analyzed from each channel: two afternoons from 4:00 to 7:00 pm, when children usually return home from educational programs and one Saturday morning (the Israeli weekend) between 8:00 and 10:00 am. The Israeli Educational Television, which has a wider audience age range, was sampled between 1:00 and 4:00 pm, hours that tend to

focus more on the study's relevant target audience. Overall, 330 shows from 111 different television series were sampled.

Although sampled in Israel, there is reason to believe that the findings from this study can be generalized to other countries because many of the channels are internationally broadcast and all channels air largely imported content (Averbach, 2016). Moreover, previous research has largely found similarities between representations on Israeli children's television shows and those in other countries (Lemish, 2011).

The current study is part of a larger content analysis aimed at analyzing the messages and values embedded in children's television programming (Te'eni-Harari & Tzur Eyal, 2017). In the current investigation, the focus was placed on analyzing television series in which the representation of ICTs was central and meaningful in the content. The authors reviewed the entire sample of shows and identified all relevant examples of ICT use within it. For each depiction identified, the authors, who served as the coders for this study, examined whether ICTs were integral to the series. This examination involved becoming familiar with all relevant series through viewing multiple episodes of the shows (also beyond the current sample) and reading about them in external sources. This investigation resulted in the identification of 22 series, represented in the current sample in one to six episodes each ($m = 3$ episodes per series in the sample), in which ICT use was found to be recurring, to the point of being central to the plot.[2] Table 1 presents the full list of series analyzed.

To answer RQ1, a content analysis was used to examine the representations of ICTs in the series. To this end, the broad conceptualization of information and communication technologies from traditional to newer forms of mediated communication devices was used to identify ICTs in the sample (RQ1a, RQ1b). The researchers coded the uses, users, and contexts of ICT use. Users (RQ1c) were coded for three main constructs: (a) age—adult versus child characters—based on appearances, voice, professional responsibilities, and family status (e.g. grandmother), (b) gender—male versus female characters—based on appearances, voices, names (Lemish, 2011), and (c) human-status—human versus anthropomorphized characters. To code RQ1d, location of ICT use was differentiated between (a) home environment, (b) outdoors (e.g. playground), (c) professional environment (e.g. lab), and (d) school environment. Purpose of ICT use was differentiated between (a) instrumental use—problem resolution, providing assistance for others, and otherwise using the ICT to achieve a specific goal, (b) social use—connecting with others, expressing empathy or acceptance, (c) learning use—using the ICT in order to extend knowledge or to understand the environment or situation, and (d) entertainment use—using the ICT for fun, to have a good time. Cases of disagreement among the researchers were resolved by reviewing the examples and conducting an in-depth discussion to reach agreement.

To answer RQ2, thematic analysis was conducted (Braun and Clarke, 2006). This analysis proceeded in several steps: after watching all the content and getting to know the series and characters, the analysis began by identifying recurring patterns that included ICT use and accompanying values. These recurring patterns were defined as primary categories. Then, the primary categories were reduced in two stages by merging and redefining categories and by selecting the main and central categories agreed upon by the

Table 1. Television series in the sample and ICTs within them (RQ1a).

Series title	Channel	ICTs
Alisa Knows What to Do!	Junior	Computerized headquarters, smart watch, hologram
Animal Party	Baby	Tablet
Children of the Tree House	Israel Educational Television Channel	Cellular, video camera
Confused Yuval—Mr. Tomato (Hebrew)	Hop	Robot, interacting hologram, television
Danny & Daddy	Baby	Computer
Fireman Sam	Hop	Fax, head set microphone, loudspeaker
Floogals	Hop	Intergalactical communication system, tablet, head-set microphone, computerized headquarters
Gingi/Redhead (Hebrew)	Junior	Robot
Life	Israel Educational Television Channel	Computerized headquarters, head set microphone
Mia & Me	Junior	A communicative bracelet, screen
Moriya-Ya (Hebrew)	Luli	Tablet
Muli & Tzumi (Hebrew)	Hop	Intergalactical communication system
Paw Patrol	Nick Junior	Computerized headquarters, tablet, cellular phone
Pirates: Adventures in Art	Israel Educational Television Channel	Computerized headquarters
PJ Masks	Disney Junior	Computerized headquarters, tablets, robots
Robo Auto Poly	Nick Junior	Computerized headquarters, head-set microphone, walkie-talkie
Schuster & Schuster (Hebrew)	Israel Educational Television Channel	Cellular, intergalactical communication system
Super Wings	Hop	Computerized headquarters, in-body built-in communication system, head-set microphone
Talking Tom & Friends	Junior	Cellular phone, computer, video cameras
Teletubbies	Luli	In-body built-in television screen, a communicative weather vane
Tim & Moby	Israel Educational Television Channel	Robot
Uncle Haim's Crazy World (Hebrew)	Hop	Telephone, tube system for message transmission

researchers as representing significant themes. A new theme identification began when meaningful categories did not validly fit already recognized themes and new clusters were considered. Examples from the series were collected for all the categories and, from these, individual examples were chosen to demonstrate each theme.

Results

ICTs in children's television content and their uses

In answering RQ1a and RQ1b (Table 1), common ICTs (in eight series) were computerized headquarters, including large computer screens and, sometimes, keyboards. The screens allowed to control security cameras, oversee happenings in remote locations, engage in video conferencing with others outside the headquarters, and provide instructions to others. Visually, the computerized headquarters were large and clearly present on the screen; they received focus in the plot as centers of control that sometimes advanced the narrative.

Other common ICTs were tablets, cell phones, and head-set microphones (together, present in 12 series)—these are more modern ICTs that are present in children's everyday lives. These devices were mostly used for interpersonal communication or for learning information. The tablets sometimes were used as convertible extensions of the headquarters.

Children's television series also portrayed robots and intergalactical communication systems (in seven series), which are non-realistic devices. The robots were usually the sidekicks for the main characters and their roles were to help, support, and teach (or serve as an instrument through which to teach the audience by having the robot ask questions and learn themselves). The intergalactical communication systems enabled communication with fantastical beings. Alongside these the study also found a hologram and in-body built-in communication systems, which are newer and fantastical technologies.

Additional ICTs in children's television series included video cameras, televisions, traditional phones, tubes, a fax machine, and a walkie-talkie (each present in one to three series)—all traditional communication technologies. All of these technologies were unequivocally used to communicate with others, to share information and experiences.

Users of ICTs in children's television content

RQ1c asked who used ICTs in children's television series (Table 2). In most cases, it was the series' main characters and/or villains who used the ICTs. Both adults (in 11 shows) and children (in 12 shows) used ICTs. Although both male and female characters used ICTs, men (19 shows) were depicted using them more often than women (13 shows). Seventeen of the shows depict ICT users who were human characters (both real and cartoon) and nine shows involved non-human anthropomorphized ICT users, including cars (*Robo Auto Poly* [Nick Junior]), planes (*Super Wings* [Hop]), animals (*Talking Tom and Friends* [Junior], *Paw Patrol* [Nick Junior], and *Animal Party* [Baby]), and non-descriptive characters (e.g. *Teletubbies* [Luli]).

Contexts of ICT use in children's television content

Settings of ICT use. RQ1d (Table 3) asked about the contexts of ICT use in children's television series. The study did not identify cases of solitary ICT use (e.g. individual video game play, listening to music alone). All uses of ICTs happened physically together (e.g. *Danny & Daddy* [Baby]) or involved interactions with others through the ICT. The

Table 2. ICT users in the sample (RQ1c).

ICT user characters	Number of series (% of sampled series)
Character age	
Adults	11 (50.00)
Childs	12 (54.55)
Character gender	
Men	19 (86.36)
Women	13 (59.09)
Character human-status	
Humans	17 (77/27)
Anthropomorphized characters	9 (40.91)

ICT: information and communication technologies.

Table 3. Contexts of ICT use in the sample (RQ1d).

ICT use contexts	Number of series (% of series)
Location of ICT use	
At home	7 (31.82)
Outdoors	11 (50.00)
Professional settings	12 (54.55)
Educational setting	1 (4.55)
Purposes of ICT use	
Instrumental purposes	14 (63.64)
Social interaction	10 (45.45)
Learning	6 (27.27)
Entertainment	3 (13.64)

ICT: information and communication technologies.

most common locations for ICT use were outdoors, in non-descript areas (e.g. *Tim & Moby* [Israeli Educational Television Channel]), and the home environment (e.g. *Danny & Daddy* [Baby]). There were also some professional locations for ICT use in shows (e.g. in *Uncle Haim's Crazy World* [Hop] ICT use happened in Haim's convenience store) as well as series in which both the home environment and the outdoors doubled as professional settings (e.g. *Talking Tom and Friends* [Junior] where the house served as an innovation invention lab). Only in one show was the ICT used primarily in the school environment (*Mia & Me* [Junior]).

Purposes of ICT use. The purpose of ICT use was often instrumental (14 of 22 shows), such as alerting others of situations or the need to engage in a task (e.g. in *Paw Patrol* [Nick Junior] a cell phone was used to call Rider the supervisor into action, to gather the puppy team, and proceed to solve a problem). Another form of instrumental ICT use was seen in the show "Mia and Me" (Junior) in which the technology was used to transfer Mia from her school into a fantastical world.

A second common purpose for using ICTs in 10 series was social interaction and promoting joint activities, such as in *Animal Party* [Baby] in which young monkey JoJo and his grandmother spend time together with the tablet and then are joined by their jungle animal friends who sit around to solve riddles that appear on the tablet. A third goal for ICT use, in six series, was to learn, such as in the case of *Floogals* [Hop] in which the scientist aliens used tablets to learn about humans' behaviors. Finally, ICTs were only rarely used for entertainment, in three series, such as in *Children of the Tree House* (Israeli Educational Television Channel) in which the group of friends used a video camera to film a vlog and document playful challenges.

RQ2 sought to identify themes associated with ICT use in children's television content. This question investigated the repeated patterns, messages, and meanings associated with ICTs in these shows by way of thematic analysis. Three main themes, each coalesced from a combination of categories that emerged in the analysis, were identified: (a) ICT use as partially reflecting the values of freedom and equality, (b) ICT use as a collectivist versus an individualistic experience, and (c) ICT use as innovation.

ICT use as partially reflecting the values of freedom and equality

The sample of children's television content in the current study reflected the value of freedom (to choose which ICT to use) and, partially, the notion of equality (the ability of everyone, regardless of demographic characteristics and prior knowledge, literacy, or other pre-requisites, to use ICTs) in its depictions of ICT use. In terms of frequency, no program was found to present constraints, obstacles, or difficulties in using ICTs; that is, all programs presented the free and active use of ICTs by characters. In most cases, the characters simply used the ICT; there was no depiction of learning about it or experiencing difficulty in operating it. There did not appear to be a restriction on who used an ICT, such as an age or status demarcation. Even characters who were supposedly uneducated about ICTs, such as the clueless and clumsy Confused Yuval (*Confused Yuval—Mr. Tomato* [Hop]) easily used sophisticated ICTs such as an interacting hologram. ICT use was depicted as natural and intuitive.

An example of ICT accessibility and ease of use was seen in the show *Alisa Knows What to Do!* [Junior]. Twelve-year-old Alisa lives in a futuristic world inhabited by spaceships and flying cars. In one episode, Alisa and her classmate visit a planet that exhibits an unexpected climate change. Alongside other adult scientists, Alisa searches for a solution using a watch that projects a hologram and a laser beam. Alisa freely and easily uses the sophisticated technology that was readily available to her to solve the problem, without even surprising or impressing the other characters. Indeed, Alisa really does know what to do, even if it involves using futuristic ICTs.

In terms of equality, the series in the sample presented ICTs as being used by almost anyone and everyone, young and older, high in status and "regular folk," human and not. In the series *Paw Patrol* (Nick Junior), Mayor Goodway uses a cell phone to call the rescue team when encountering problems, whereas 10-year-old Ryder, the team's human leader, uses his tablet and head-set microphone (also used by the pups) to respond through a video chat to the call and to gather his team of rescue puppies. An episode

titled "Pups in a Jam" depicts this recurring ICT use as well as a female farmer and a male jam booth owner who both use cell phones to elicit the team's help in expulsing an ant infestation.

The pattern of portrayals is more complex with regard to gender and ICT use. Whereas female characters are represented with ICTs in this sample, they are still outnumbered by male characters, as is often the case in televised portrayals (Elias et al., 2017). The unequal quantitative representation was also found in the larger sample from which the current study's series were drawn (Aharoni et al., 2020), which found that male persona outnumbered female persona in children's shows. However, the qualitative portrayals in the larger sample were more egalitarian, and even stereotype-contesting, with women presented as both aggressive and passive, emotional and rational, professional, competitive, and even as fighters.

ICT use as a collectivist versus an individualistic experience

This theme was a combination of two repetitive categories in the content: (1) the use of technology as a connector between individuals and a team and (2) technology use for self-definition. In terms of frequency, the large majority of programs (21 series) depicted collectivist, social aspects of ICT use, often (in 13 series) combined with individualistic portrayals. Overall, the current sample reflects the full range of portrayals on the collectivist-individualistic spectrum associated with ICT use. An example of ICT use for a collectivist, community purpose was found in the series *Fireman Sam* (Hop) in which ICTs (fax machine, loudspeakers) were used to alert the firemen to the fire dangers in the city of Pontypandy. The ICTs support the strong community links that are promoted in the episodes as can be seen in the warm familiarity between citizens who gather around and support the fireman squad.

ICTs that encourage a strong family bond were seen in the series "Danny and Daddy" [Baby]. Here, daddy invites Danny to play with him outdoors but instead Danny invites his father to play together on the computer. There, the two play matching games and solve riddles. The series shows that an ICT can be used to reconnect the generations and allow them to spend fun quality time together.

An example of use of ICTs for individualist goals can be seen in the series *PJ Masks* (Disney Junior). Here, the three main characters face problems during the day and then turn into superheroes at night to find solutions. They often face an antagonist, Romeo, who uses a robot to pursue his offensive goals of harming and controlling his fellow residents. In an episode titled "Gekko and the Mayhem in the Museum," Romeo seeks to gain control of the town. When his plan goes awry, it is his Robot who helps Romeo escape his own failings and pursue his evil individualistic goals.

Another individualistic manifestation of ICTs in the current sample was the use of ICTs to define a character's personal identity. For example, the *Teletubbies* (Luli) are characterized by stomachs that house a television screen. In *Super Wings* (Hop), which deals with an international delivery service operated by a group of anthropomorphized airplanes, Jimbo is the main traffic controller who derives his authority from the headset microphone that he always wears. Jimbo uses the microphone at the start of each episode to summon the airplanes to the headquarters. Even when standing face-to-face

with the airplanes, Jimbo still communicates wearing the microphone and his voice sounds mechanical, electronically mediated.

Innovativeness in ICT use

The current sample involves several portrayals of ICTs as innovations, which emerged from two categories that were prominent in the sample: the depiction of the newness of ICTs and their ability to advance original knowledge-based solutions (in 11 of 22 series). For example, the series *Floogals* (Hop) centers on tiny aliens sent to earth to investigate and educate their fellow aliens about it. In an episode titled "Project Rabbit," Flo uses augmented reality glasses to measure objects and a tablet to explore historical changes. Captain Fleeker uses a magnifying glass to explore evidence in the grass. Once the information is compiled, the *Floogals* use a blue laser beam to send a report back to their home planet, supported by footage captured during their work. Old and new ICTs complement one another in analyzing, highlighting, and mediating the information to benefit and teach others.

Newness as ICT innovation can also be observed across the sample of television shows in this study with regard to the portrayal of robots as ICTs. Four series include robots as recurring side-kicks to the central characters. Three of these were created by professors, marking them as scientific inventions. Still, much variation was depicted in the sample's robots: from old-fashioned, mechanic, and metallic constructions who communicate via Morse-code-like sounds (*Tim & Moby* [Israeli Educational Television Channel], *PJ Masks* [Disney Junior]) to more human-like figures who speak in metallic voices (*Confused Yuval—Mr. Tomato* [Hop]), to a robot who appears to be so real, that she is unrecognized as a robot by those unfamiliar with her special abilities (*Gingi/Redhead* [Junior]).

Surprisingly, creativity and originality—which are often considered staples of technological innovativeness (Johannessen et al., 2001)—were rarely present in ICT depictions in the current sample. A rare example was found in an episode of *Talking Tom and Friends* [Junior] titled "The Audition." Tom and his friend Ben the dog film an audition tape for a new reality show. In trying to document the innovativeness of their lab, Tom and Ben introduce the expensive technological equipment used to conjure the "mind-blowing, life-changing, high-tech inventions." They emphasize their unique creative personalities as visionaries and tech geniuses. In this process, Tom learned that all he needs to succeed is to be creative and possess "a video camera, a computer, and a bunch of crazy goof-ball friends," like he already does.

Discussion

The current study examined the representation of ICTs in children's television content. Young children are heavily exposed to television shows while at the same time increasingly using ICTs at home and in their school environments (Crompton et al., 2018). Alongside their personal experiences, children can also learn about ICTs—the norms, characteristics, and values associated with their use—from exposure to televised ICT portrayals, a major socialization agent for this age group. The study analyzed ICT

portrayals in 22 children's series broadcast on Israeli children's television channels. The conclusions below emerged from the content analysis and thematic analysis in conjunction, as the two ways of evaluating the sample complement one another.

ICTs presented in children's television content: adult-oriented and futuristic ICTs

In responding to RQ1a, the most common ICTs in children's television series in this sample were computerized headquarters, followed by modern technologies, and newer and even futuristic technologies, including robots and intergalactical communication systems. Traditional ICTs such as television were less prevalent. Such advanced ICTs inhabit mostly the adult world (e.g. computerized headquarters in the stock market, flight, or military sectors) and are essentially non-existent and non-accessible in children's everyday lives. The implication may be that, whereas such depictions might instigate children's imagination and future aspirations and alleviate concerns about using these newer technologies (e.g. Sunder et al., 2016), they lack a more concrete and realistic anchor. As such ICTs are less relevant and, thus, less realistic, their depiction is limited in its potential for teaching children about ICTs (Strasburger et al., 2014).

The excess representation of non-child-relevant ICTs is mirrored by the under-representation of everyday ICTs in children's television shows. Missing from the current sample nearly altogether were representations of the Internet, social media, and social apps. Children's shows seem to ignore many technologies that are relevant and present in children's lives (Israel National Council for the Child, 2018), missing out on opportunities to convey to children important messages about responsible and creative uses of technologies which will soon become even more central to their lives.

Uses of ICTs as represented in children's television content: ICT use as functional and easy

ICT use was largely functional in children's series. That is, ICT use served a clear purpose, allowing control over the environment and enabling problem resolution. ICTs were shown to structure interpersonal communication (e.g. calling others to action, mobilizing community efforts) and share information or experiences with others. Such depictions nearly entirely ignored the emotional or relational aspects involved in ICT use as they are heavily information-oriented. Even the ICT-centered interpersonal exchanges in these series were mainly goal-oriented and involved little emotional connection or sharing of personal experiences and affective states. Such information-biased depictions overlook many other uses of ICTs, especially those that dominate children's world, including entertainment, play, and social bonding. These findings echo the surprising adult-focus of ICT depictions in children's shows and the concerns over the skewed and biased representation of children's world (Meyrowitz, 1985; Postman, 1982).

Interestingly, ICT use in the sampled series was largely depicted as natural, expected, and accepted unequivocally. In these shows, there were multiple technologies from which to choose and diverse uses for them. On one hand, seeing ICTs easily integrated into many everyday interactions on television and often serving as acceptable means for

problem-solving likely communicates the message that ICTs are valid solutions, enhancing self-efficacy in ICT use. On the other hand, such idealistic depictions ignore the challenges involved in operating ICTs, the fact that ICT use may sometimes go astray, as well as the learning curve required to effectively operate them.

ICT users in children's television content: near equality in ICT use

Everyone uses even the most complex ICTs in children's series—regardless of their age, realism, role, and status—and there appear to be no barriers to such use. In this, ICT portrayals avoid common stereotypes in children's shows (Lemish, 2011). According to the story-telling function of television underlying the cultivation hypothesis (Shrum, 2017), for young audiences, seeing child and minority characters use ICTs freely and easily can be an empowering and educational experience. Gender is a demographic variable for which meaningful differences were still observed, with male characters outnumbering female characters in the use of ICTs, as is common in other televised portrayals (Elias et al., 2017). In terms of the contexts of ICT use, gender differences were not observed in this sample, similar to Gerding and Signorielli (2014).

Such depictions are interesting to consider in light of the conception of children as digital natives, that is, citizens born into, and raised within, a technological world with a predetermined set of technological skills (Evans and Robertson, 2020). Portrayals of child characters who easily operate technologies, without the need for adult intervention, seem consistent with the initial stage of the "digital natives" debate. However, whereas in the real world the term is today heavily contested by scholars and educators, the televised world as depicted in the current sample represents no such concerns. The series sampled here seem to ignore much of the real-world complexity about ICTs as reflected in the development of the "digital natives" debate: the digital divide, the knowledge gaps between the technological haves and have-nots, and the difficulty in efficiently handling media multitasking situations (Evans and Robertson, 2020; Scherer and Siddiq, 2019). For children who experience such deficiencies in their lives, exposure to ICT portrayals may be associated with disappointments, feelings of alienation, and life dissatisfaction. The association of ICT use with successful functioning and its centrality in the everyday lives of televised characters may lead—when juxtaposed with more restricted real-life experience with technologies—to decreased self-efficacy and diminished future technological aspirations.

Contexts of ICT use in children's television content

As noted above, ICTs were portrayed as largely functional for the characters in children's television content, serving instrumental purposes of problem resolution and creating opportunities for social interaction. Part of the functionality of ICTs in these shows is represented through their joint use by multiple characters and even groups of characters. Such portrayals seem to promote collectivist value and community connectedness, the co-use of ICTs for the good of others, and to serve the needs of society. In real life, however, ICT use is often solitary, even associated with moral panics about technologies leading to anti-social distancing and isolation (Balockait et al., 2008).

Perhaps surprisingly, notwithstanding a few rare examples (e.g. *Danny & Daddy* [Baby]), missing from the current sample were depictions of parent–child co-use of ICTs. Such intergenerational depictions could have contributed to the encouragement and instigation of technological mediation experiences in the home (Lawrence and Choe, 2021). This finding is in line with a conclusion drawn from the larger analysis of this sample of shows, unrelated to ICT use (Eyal et al., 2021): child characters in children's shows largely functioned separately from parents in their televised worlds. It is also consistent with a finding from a content analysis of children's programming in 24 countries about the rare presence of families and the peripheral role for adults in these shows (Lemish, 2012).

Another interesting finding was the almost non-existent portrayal of ICTs in the school environment. Most depictions occurred at the home or outside of it, sometimes in professional adult settings. In the one series in which ICTs were depicted at school, technology was used to escape the school reality into a fictional context. This finding is in contrast to most academic research on ICT use among children, which largely focuses on the uses of ICTs in educational environments (Roberts-Holmes, 2014). Cultivation theory (Gerbner et al., 1994; Shrum, 2017) emphasizes the importance of resonance between a viewer's real-life circumstances and the reality to which they are exposed on television. When such correspondence occurs, the opportunity for learning and acquiring norms and values is heightened. However, when children's real-life home and school experience with ICTs is largely ignored on the television series to which they are heavily exposed, the application of the content to their experiences might be minimal.

A final interesting context that emerged from the thematic analysis was that the shows in the current sample emphasized the innovativeness of ICTs and their important role in advancing new knowledge, encouraging original solutions, and distributing new information to promote learning. Such depictions are in line with the view of ICT innovation as newness (Abbott et al., 2001). However, the innovativeness of ICTs in these shows lacks creativity. Because much of the ICT use in these shows is focused on finding solutions and because the solutions are easily achieved through the use of ICTs, ICTs seem to provide an easy, intuitive, and accessible answer without necessitating exploration and creativity. This finding is surprising because the same set of shows analyzed herein, when subject to a previous analysis of messages conveyed (Author, 2020), identified quite a significant presence for creativity, but this creativity was not associated with ICTs. It seems that when the characters do not have access to ICTs, but rather to more simplistic means such as cardboard boxes and tree branches, they exercise much more originality in their thinking and actions than when ICTs are available to them. ICTs in children's shows seem to offer a quick solution, thus obsoleting the need to search for answers, although creativity is considered an important part of ICTs.

Conclusion

The study finds that ICTs are depicted in children's television series as largely positive, promoting community connectedness and problem resolution, and as effective innovations for the dissemination of information to create new knowledge. These depictions are in line with the idea of access and are generally free of stereotypes—with the exception

of the quantitative representation of gender, similar to other programming (e.g. Gozansky and Lemish, 2019). At the same time, these depictions are less relevant and realistic for children's everyday lives, ignore many aspects of media technologies that are central for children (e.g. play and entertainment), and avoid the social and emotional aspects—both positive and challenging—that are associated with ICTs in children's real world. Cultivation theory would argue that such messages present a uniform and overly simplistic worldview about ICTs, missing out on important learning opportunities about the role of ICTs in children's lives (Gerbner et al., 1994). Children's television productions can benefit from the current study's findings to the extent that they try to be more up-to-date with regard to children's constantly evolving everyday ICT use, its purposes, and challenges so as to reflect these more accurately in the content.

Limitations and future research directions

The conclusions drawn from the study highlight important messages communicated in children's television content about ICTs. However, to understand the implications for and interpretations of these depictions by child viewers, reception, and effects studies are needed. Cultivation effects studies can examine the values that children associate with ICTs and the extent to which these resonate with the values depicted in the series they view. Studies based on social cognitive theory (Bandura, 2009) can examine what technology-related behaviors children learn from television content, thus expanding the theoretical contribution of the current investigation.

Moreover, though the series analyzed in this study were largely international, future research can address local programs and consider the presentation of ICTs in light of different cultural characteristics (Lemish, 2010). One interesting local context may be to examine whether Israel's standing as a leader in technological innovation and a "Start-Up Nation" (Deloitte, 2022) finds its way into television content.

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Notes

1. Sampled in 2017, all series were aired since then on Israeli television, with nine series airing also in late 2021, some with new seasons (e.g. *Fireman Sam* [Hop], *Children of the Tree*

House [Israel Educational Television Channel]). Some series in the sample are still some of the most popular children's shows worldwide (e.g. Barak, 2020; Lascala and Jeon, 2020).

2. Only nine additional scenes of information and communication technology (ICT) use were identified in the sample, but these were sporadic examples, unrepresentative of the series. These nine irregular portrayals were excluded from the current analysis.

References

Abbott C, Lachs V and Williams L (2001) Fool's gold or hidden treasure: are computers stifling creativity? *Journal of Education Policy* 16: 479–487.

Aharoni M, Eyal K and Te'eni-Harari T (2020) Princesses and fighters on a journey toward a (partial) challenging of gender stereotypes on television programs to children in Israel [Hebrew]. *Migdar [Gender]: An Academic Interdisciplinary Journal of Gender & Feminism* 7. Available at: https://a0892f23-8915-4259-a76e-148e464cfcf1.filesusr.com/ugd/6ec31f_076f91b24b6b478da5b78bb4e6a5ce28.pdf

Alade F, Lauricella A, Kumar Y, et al. (2021) Who's modeling STEM for kids? A character analysis of children's STEM-focused television in the US. *Journal of Children and Media* 15(3): 338–357.

Alade F, Lauricella AR, Kumar Y, et al. (2022) Impact of exposure to a counter-stereotypical STEM television program on children's gender- and race-based STEM occupational schema. *Sustainability* 14(9): 5631.

Averbach LO (2016) Their baby: this is how the channel Baby became the most successful Israeli content initiative in the world. *Globes [Hebrew]*, 3 January. Available at: https://www.globes.co.il/serve/globes/printwindow.asp?did=1001092801

Balockait R, Morkevicius V, Vaidelyt E, et al. (2008) The impact of new ICTs on democracy: positive and negative scenarios. *Social Sciences* 1: 81–92.

Bandura A (2009) Social cognitive theory of mass communication. In: Bryant J and Oliver MB (eds) *Media Effects: Advances in Theory and Research*. 3rd ed. New York: Routledge, pp. 94–124.

Barak O (2020) The first has been ignited for years: how did "Fireman Sam"33 become the most popular children's television show in the world? *YNet* [Hebrew], 18 March. Available at: https://www.ynet.co.il/articles/0,7340,L-5692132,00.html

Baregheh A, Rowley J and Sambrook S (2009) Towards a multidisciplinary definition of innovation. *Management Decision* 47(8): 1323–1339.

Braun V and Clarke V (2006) Using thematic analysis in psychology. *Qualitative Research in Psychology* 3(2): 77–101.

Crompton H, Gregory K and Burke D (2018) Humanoid robots supporting children's learning in an early childhood setting. *British Journal of Educational Technology* 49: 911–927.

Deloitte (2022) Perspectives: the Israeli technological eco-system, a powerhouse of innovation. Available at: https://www2.deloitte.com/il/en/pages/innovation/article/the_israeli_technological_eco-system.html (accessed 26 June 2022).

Elias N, Sulkin I and Lemish D (2017) Gender segregation on BabyTV old-time stereotypes for the very young. In: Lemish D and Gotz M (eds) *Beyond the Stereotypes? Images of Boys and Girls, and Their Consequences*. Goteborg: Nordicom, pp. 95–104.

Evans C and Robertson W (2020) The four phases of the digital natives debate. *Human Behavior and Emerging Technologies* 2(3): 269–277.

Eyal K, Te'eni-Harari T and Aharoni M (2021) The world belongs to the young: representation of socialization agents in early childhood television content. *Communication Reports* 34(2): 51–64. Available at: https://doi.org/10.1080/08934215.2021.1907427

Gerbner G, Gross L, Morgan M, et al. (1994) Growing up with television: the cultivation perspective. In: Bryant J and Zillmann D (eds) *Media Effects: Advances in Theory and Research*. Hillsdale, NJ: Erlbaum, pp. 17–41.

Gerding A and Signorielli N (2014) Gender roles in tween television programming: a content analysis of two genres. *Sex Roles* 70: 43–56.

Gozansky Y and Lemish D (2019) Still "about boys and girls": what has changed a decade later in gender representation in television programming for children in Israel? [Hebrew]. *Migdar [Gender]: An Academic Interdisciplinary Journal of Gender & Feminism* 6. Available at: https://www.migdarjournal.com/blank-6

Hiniker A, Schoenebeck SY and Kientz JA (2016) Not at the dinner table: parents' and children's perspectives on family technology rules. In: *Proceedings of the th19 ACM conference*, San Francisco, CA, 27 Fenruary–2 March.

Huda M, Jasmi KA, Hehsan A, et al. (2017) Empowering children with adaptive technology skills: careful engagement in the digital information age. *International Electronic Journal of Elementary Education* 9(3): 693–708.

Israel National Council for the Child (2018) The annual statistics: children in Israel 2018. A collection of data. Available at: https://www.children.org.il/wp-content/uploads/2020/02/%D7%94%D7%9E%D7%95%D7%A2%D7%A6%D7%94-%D7%9C%D7%A9%D7%9C%D7%95%D7%9D-%D7%94%D7%99%D7%9C%D7%93-%D7%A9%D7%A0%D7%AA%D7%95%D7%9F-%D7%A1%D7%98%D7%98%D7%99%D7%A1%D7%98%D7%99-%D7%99%D7%9C%D7%93%D7%99%D7%9D-%D7%91%D7%99%D7%A9%D7%A8%D7%90%D7%9C-2018.pdf

Johannessen JA, Olsen B and Lumpkin GT (2001) Innovation as newness: what is new, how new, and new to whom? *European Journal of Innovation Management* 4(1): 20–31.

Kabali HK, Irigoyen MM, Nunez-Davis R, et al. (2015) Exposure and use of mobile media devices by young children. *Pediatrics* 136(6): 1044–1050.

Kaesling K (2021, June) The making of citizens: democracy and children's rights in digital spheres. In: *Proceedings of the Weizenbaum conference 2021: Democracy in flux order, dynamics and voices in digital public spheres*. Berlin.

Knupfer NN (1998) Gender divisions across technology advertisements and the www: implications for educational equity. *Theory into Practice* 37(1): 54–63.

Konca AS and Koksalan B (2017) Preschool children's interaction with ICT at home. *International Journal of Research in Education & Science* 3: 571–581.

Lascala M and Jeon H (2020) These are the hottest kids' TV shows to watch as a family this season: everything you liked when you were a kid is coming back in the best way. *Good Housekeeping*, 13 August. Available at: https://www.goodhousekeeping.com/life/entertainment/g/best-kids-tv-shows/28087907

Lauth HJ (2016) The internal relationships of the dimensions of democracy: the relevance of trade-offs for measuring the quality of democracy. *International Political Science Review* 37(5): 606–617.

Lawrence A and Choe DE (2021) Mobile media and young children's cognitive skills: a review. *Academic Pediatrics* 21(6): 996–1000.

Lemish D (2010) *Screening Gender on Children's Television: The Views of Producers around the World*. London: Routledge.

Lemish D (2011) The girls on the boys: mapping gender and family in children's television programs in Israel. *Misgarot Media* 6: 61–88[Hebrew].

Lemish D (2012) "Without a family": representations of families in children's TV around the world. In: Götz M and Lemish D (eds) *Sexy Girls, Heroes and Funny Losers: Gender Representations in Children's TV around the World*. New York: Peter Lang, pp. 151–168.

Magen-Nagar N and Firstater E (2019) The obstacles to ICT implementation in the kindergarten environment: kindergarten teachers' beliefs. *Journal of Research in Childhood Education* 33: 165–179.

Meyrowitz J (1985) *No Sense of Place: The Impact of Electronic Media on Social Behavior*. Oxford: Oxford University Press.

Morgan M, Shanahan J and Signorielli N (2014) Cultivation theory in the twenty-first century. In: Fortner RS and Fackler PM (eds) *The Handbook of Media and Mass Communication Theory*. Hoboken, NJ: John Wiley & Sons, pp. 480–497.

OECD (2019) What do we know about children and technology? Available at: https://www.oecd.org/education/ceri/Booklet-21st-century-children.pdf

Plowman L, McPake J and Stephen C (2010) The technologisation of childhood? Young children and technology in the home. *Children & Society* 24: 63–74.

Postman N (1982) *The Disappearance of Childhood*. New York: Delacorte Press.

Potter WJ (2014) A critical analysis of cultivation theory. *Journal of Communication* 64(6): 1015–1036.

Roberts-Holmes G (2014) Playful and creative ICT pedagogical framing: a nursery school case study. *Early Child Development and Care* 184: 1–14.

Romer D, Jamieson P, Bleakley A, et al. (2014) Cultivation theory: its history, current status, and future directions. In: Fortner RS and Fackler PM (eds) *The Handbook of Media and Mass Communication Theory*. Hoboken, NJ: John Wiley & Sons, pp. 15–36.

Rossler P (2001) Between online heaven and cyberhell: the framing of "the internet" by traditional media coverage in Germany. *New Media & Society* 3(1): 49–66.

Scherer R and Siddiq F (2019) The relation between students' socioeconomic status and ICT literacy: findings from a meta-analysis. *Computers & Education* 38: 13–32.

Selwyn N (2003) Doing IT for the kids': re-examining children, computers and the information society. *Media, Culture & Society* 25(3): 351–378.

Sharkins KA, Newton AB, Albaiz NEA, et al. (2016) Preschool children's exposure to media, technology, and screen time: perspectives of caregivers from three early childcare settings. *Early Childhood Education Journal* 44: 437–444.

Shaw P and Tan Y (2015) Constructing digital childhoods in Taiwanese children's newspapers. *New Media & Society* 17(11): 1867–1885.

Shrum LJ (2017) Cultivation theory: effects and underlying processes. *The International Encyclopedia of Media Effects* 1–12.

Stamou AG, Maroniti K and Griva E (2015) Young children talk about their popular cartoon an TV heroes' speech styles: media reception and language attitudes. *Language Awareness* 24(3): 216–232.

Strasburger VC, Wilson BJ and Jordon AB (2014) *Children, Adolescents, & the Media*. 3rd ed. Thousand Oaks, CA: SAGE.

Sunder SS, Waddell TF and Jung EW (2016) The Hollywood robot syndrome: media effects on older adults' attitudes toward robots and adoption intentions. In: *11th ACM/IEEE international conference on human-robot interaction (HRI)*, Christchurch, New Zealand, 07–10 March.

Te'eni-Harari T and Tzur Eyal K (2017) *Final Research Report on the Topic of: Explicit and Implicit Messages in Television Shows Aired on Young Children's Channels in Israel*. Submitted to the Committee for Children's Rights, Israeli Parliaent (Knesset).

Te'eni-Harari T and Yadin R (2019) Regulatory literacy: rethinking television rating in the new media age. *UMKC Law Review* 88: 1–14.

Third A, Livingstone S and Lansdown G (2019) Recognizing children's rights in relation to digital technologies: challenges of voice and evidence, principle and practice. In: Wagner

B, Kettemann MC and Vieth K (eds) *Research Handbook on Human Rights and Digital Technology: Global Politics, Law and International Relations*. Cheltenham: Edward Elgar Publishing, pp. 376–410.

Thomas EM and Rajan R (2018) Nosediving into simulation through consumptive viewing. In: Cirruci AM and Vacker B (eds) *Black Mirror and Critical Media Theory*. Lanham, MD: Lexington Books, pp. 223–234.

ViacomCBS Global Insights (2016) Connected kids. Available at: https://insights.viacom.com/categories/research-studies/connected-kids/

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