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What Babies, Infants, and Toddlers Hear on Fox/Disney BabyTV: An Exploratory Study

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Sound and music are integral components of screen content. Yet, little research has been undertaken exploring soundscapes of infant-directed broadcasts. The current study implements a soundscape analysis of a representative corpus broadcast on Fox/Disney BabyTV for young children between the ages of 0 and 3 years; we considered both musical and linguistic constituents as structural components of the soundscape. The current study randomly selected 1 episode from each of the 39 series broadcast on the BabyTV channel; these were viewed 5 times (195 episodes, 682.5 min). Rater coding was based on 2 in-house developed measures: the *Soundscape Appraisal of Broadcast Series* and the *Sulkin Infant Song Inventory*. The results indicate that the sound and music constituents used attract young viewers to the screen but are developmentally inappropriate, as they do not facilitate young viewers engagement with the screen (singing and body movement). Moreover, as linguistic constituents are mostly nonintelligible utterances, not only might young viewers be hampered in recall of content, but they would not benefit from screen exposure toward developing more comprehensible speech and language. This article calls for the need of writers and producers of media screen content to design more suitable developmentally appropriate programs for baby-, infant-, and toddler-viewers.

Public Policy Relevance Statement

Sound and music are components of programs for young viewers that enhance child development. The current study analyzed the soundscape of 39 infant-directed TV broadcasted series from BabyTV. The results indicate that music and linguistic materials are developmentally inappropriate. The article discusses an urge for cooperation between media content creators and child development experts.


Keywords: soundscape analyses, children's TV, media for young children, video deficit effect

This study explores the *soundscape* of infant-directed TV. Both musical and linguistic constituents as structural components are considered. The study employs in-house measures used for content analysis of televised programming.

Screen viewing has become a very common activity for children under 3 years of age, with products designed and marketed specifically for babies, infants, and toddlers. The American Academy of Pediatrics (AAP, 2016) advocates that screen time of digital media among young children less than 18 months should be avoided altogether, and for children 2 to 5 years old should be limited to 1 hr per day. Nonetheless, today, infants begin viewing screen content at the age of about 6 months, and by the age 2 years, 74% to 90% of children spend a minimum of 2 hr per day in front of screens (Barr, Danziger, Hilliard, Andolina, & Ruskis, 2010;

Elias & Sulkin, 2017, 2019; Tandon, Zhou, Lozano, & Christakis, 2011; Taylor, Monaghan, & Westermann, 2018; Vaala & Hornik, 2014; Wartella, Rideout, Lauricella, & Connell, 2014). On the one hand, screen exposure and the content of media for young children can have negative consequences, including attention deficits (Christakis, Zimmerman, DiGiuseppe, & McCarty, 2004; Landhuis, Poulton, Welch, & Hancox, 2007; Zimmerman, Christakis, & Meltzoff, 2007a) and poor language acquisition (Zimmerman, Christakis, & Meltzoff, 2007b). On the other hand, programs featuring developmentally appropriate content (e.g., *Sesame Street*, *Blues Clues*, *Mister Rogers' Neighborhood*) can enhance cognitive development (Ball & Bogatz, 1970; Bogatz & Ball, 1971; Wright et al., 2001), improve language skills (Rice, Huston, & Wright, 1982), expand prosocial abilities (Stein & Friederich, 1975), and contribute to an overall positive educational experience with increased scholastic performance (Anderson, Huston, Schmitt, Linebarger, & Wright, 2001; Wright et al., 2001).

Several studies demonstrate that young children learn less from TV than from face-to-face interactions (Anderson & Pempek, 2005; Barr, Muentener, & Garcia, 2007; Flynn & Whiten, 2008; Krmar, Grela, & Lin, 2007; Schmitt & Anderson, 2002). This is referred to as the *video deficit effect* (Anderson & Pempek, 2005;

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Barr, Shuck, Salerno, Atkinson, Linebarger, 2010). The deficit is an inability to convert information from a flat screen to real life (Barr, 2010; Barr & Wyss, 2008). This limited ability to mirror videotaped actions peaks around 15 months but can persist until 30 months (Barr & Hayne, 1999; Barr et al., 2007; Flynn & Whiten, 2008; Strouse & Troseth, 2008). Moreover, until the middle of the second year of life, very young children may not comprehend video programs (Anderson, Lorch, Field, & Sanders, 1981; Pempek et al., 2010). Two main perspectives on children's ability to attend to screen content exist: (1) sustained attention results from the salient formal features of screen content such as movement, cuts, zooms, pans, and a variety of auditory sounds that elicit an orienting reflex (Singer, 1980), and (2) attention to screen content is a learned cognitive activity driven by comprehension activities (Anderson & Lorch, 1983).

In their efforts to understand how children can overcome the deficit, investigations have shown that online amelioration occurs by repeating target actions (Barr et al., 2007), augmenting matched sound effects to targeted actions (Barr, Wyss, & Somanader, 2009), adding language cues (Barr & Wyss, 2008; Zack, Barr, Gerhardstein, Dickerson, & Meltzoff, 2009), and increasing on-screen social interactions (Nielsen, Simcock, & Jenkins, 2008; Troseth, Saylor, & Archer, 2006). One might conclude, then, that designing infant-directed programs with specific features could actually boost learning from screen content. Specifically, visual and auditory production features have operational roles in counterbalancing video deficit effects (Barr, Shuck, et al., 2010; Goodrich, Pempek, & Calvert, 2009; Troseth & DeLoache, 1998), for example, employment of characterized movement and action play, use of energizing color palettes and figurative designs, incorporation of a decelerated temporal pace (e.g., slower scene changes and character fluctuation), matching sound effects with visual content, and a transparent arrangement of background music. Namely, some broadcast programming might be *developmentally appropriate* by providing content that actively engages infant- and toddler-viewers by facilitating optimal responses with the screen, including those with their body (i.e., movement sequences), language (i.e., speech, vocabulary), voice (i.e., singing, articulatory gestures), and brain (i.e., thinking, understanding). Alternatively, broadcast programming might be *developmentally inappropriate* by providing content that disengages infant- and toddler-viewers from meaningful responses with the screen. Although Huston and Wright (1983) long ago claimed that sound effects and music tracks could prime infants' level of understanding, only more recently have empirical investigations demonstrated the effects of music on facilitating young children's capacity to imitate behaviors seen on the screen (Barr et al., 2009; Barr, Zack, Garcia, Muentener, 2008).

Background Music: A Constituent of the Soundscape

If the presence of sound and music assists learning and transferring information necessary for interpretation and behavioral responses (Brooks, 2015), then music is not simply a decorative feature but rather an essential constituent component of infant-directed content. In fact, several investigators advocate that developmentally appropriate soundtracks explicitly manage the passage from 2D animations to 3D real world settings (Barr et al., 2009; Saffran, Loman, & Robertson, 2000). Such implications indicate

the need to use a well-designed audio track that not only reduces obstruction of the visual content but is optimally matched to support comprehension and interaction with the screen. It is then rather surprising that so few series use *songs* in their broadcast programming for babies, infants, and toddlers.

Songs are a significant platform for learning among young children (Longhi, 2009; Nakata & Trehub, 2004; Shenfield, Trehub, & Nakata, 2003). Songs accelerate cognitive, emotional, and sensorimotor skills (Sulkin, 2009). For the purpose of enhancing optimal development (Brodsky & Sulkin, 2011; Longhi, 2009; Malloch, 1999; Nakata & Trehub, 2004; Shenfield et al., 2003), characteristic features include high-pitched tones, slow rhythmic patterns, clear accentuations, and repetitions; these have all been found in musicological studies as qualities in children's songs across cultures (e.g., Pai, 2009). Accordingly, a song's developmental appropriateness reflects features that encourage age-related capabilities to reproduce the song. For example, as infants repeat basic consonant and vowel syllables and attempt to construct them in an effort to verbalize preliminary words, the most age-appropriate songs are those that emphasize short utterances with repeating words and rhymes (Greenberg, 1979; Sulkin & Brodsky, 2015).

Shehan-Campbell (2002) referred to the body of repertoire for children as "Childlore" (i.e., songs are essentially the folklore culture of children); Sulkin (2003) viewed children's songs as "nature's training ground for early childhood development" (p. 123). She outlined the characteristics of children's songs and declamation rhymes (i.e., rhythmic word phrases recited without a specific composed melody). Subsequently, Sulkin (2009; Brodsky & Sulkin, 2011) demonstrated the repetitive structure of singing games as enabling children to improve tactile sensory awareness, motor control proficiencies, and auditory-visual perceptive competencies. Other studies found that songs and rhymes increase verbatim recall (Calvert & Tart, 1993) and facilitate capabilities to rehearse content of a visual nature (Calvert, 2001; Huston et al., 1981; Johnson & Hayes, 1987). Many studies document children interacting with the screen by participating with the content; they stand opposite the video display and sing, dance, clap, and move their body (Barr et al., 2009; Marsh et al., 2005; Rutherford, Bittman, & Biron, 2010). Clearly, if screen content targeting infants and toddlers include songs, then, research efforts toward mapping-out the characteristic features of music and songs used in screen content is essential. Yet, few studies have explicitly investigated the sonic features found in media for children younger than 3 years (e.g., Brooks, 2015; Goodrich et al., 2009).

As parents rely on screen viewing as a staple part of everyday childcare (DeLoache & Chiong, 2009; Elias & Sulkin, 2017, 2019; Rideout, 2013), investigating music that is found in infant-directed broadcasts is necessary. Especially today, during the 2020 Corona Virus (Covid-19) pandemic, with families all over the world experiencing home quarantine confinement (i.e., seclusion from childcare settings and educational frameworks), babies, infants, and toddlers are exposed to a considerable amount of screen content. Therefore, it is all more warranted that parents become aware of the developmental (in)appropriateness of screen content as found in infant- and toddler-directed broadcasts, to which the parents themselves expose their young children as captive viewers, because other alternative options have been withdrawn by parliamentary efforts to lower risks and fatalities.

Linguistic Utterances: A Constituent of the Soundscape

Linguistic utterances and language are a second constituent of the soundscape found in infant-directed broadcasts. Early language development is stimulated by the linguistic input infants hear on a regular basis. Although the most influential sources are parents and siblings, daily exposure to other sounds (especially screen-based viewing) is inescapable (Krcmar et al., 2007; Linebarger & Vaala, 2010). Infancy and toddlerhood are periods in which young children need to engage with predictable sequences of language development. At roughly 12 months of age, children begin to produce their first words, and by 24 months, they use roughly 50 words to express themselves. The most optimal window of development seems to be just after 2 years (Hartman, Ratner, & Newman, 2017) whereby word acquisition continues at a rapid pace as children experience a *vocabulary spurt* (Goldfield & Reznick, 1996). Accordingly, during this surge, toddlers can acquire five new words a day (Bloom & Markson, 1998), depending on environmental factors including interactions with caregivers and exposure to media (Costa, Wilkinson, McIlvane, & Gracas de Souza, 2001; Kay-Raining Bird & Chapman, 1998; Naigles & Hoff-Ginsberg, 1998).

Krcmar et al. (2007) found that young children have difficulty with voice-overs until roughly 22 months, and hence vocabulary acquisition from televised broadcast among infants occurs more if an accompanying adult concurrently reproduces screen content aloud. Pempek et al. (2010) suggested that infants may not distinguish between comprehensible language and incomprehensible ‘babble’ until 16 months old. But, after 24 months, children can increasingly learn vocabulary from screen content. For example, Barr and Wyss (2008) demonstrated that from 2 years, children can equally use language learned from either a parent or a ‘voice-over.’ Nonetheless, Linebarger and Vaala (2010) stated that screen-based language learning is not only dependent on the attributes of environmental contexts surrounding media use, but on the specific characteristic features of the broadcast itself. Previously, Linebarger and Walker (2005) found the number of words learned was associated to the language strategies employed in programming. For example, episodes from *Blue’s Clues* and *Dora The Explorer* series (employing comprehensible language) encouraged greater vocabularies as demonstrated by higher expressive language scores of the young viewers; episodes from *Teletubbies* (using language-like derivatives of *gibberish* and *intonations*) prompted a more restricted number of words as demonstrated by lower expressive language scores. *Gibberish* is essentially meaningless prosodic utterances combining consonants and vowels syllables such as “tutupitu” or “cocololo”; intonations are essentially vocal utterances combining phonological sounds such as “aaaa,” “uuuu,” and “oooo.” These findings were replicated by Krcmar et al. (2007).

To our knowledge, no study has explored the soundscape of infant-directed broadcasts; neither for televised programming, downloadable content from Internet channels (e.g., YouTube), nor subscription-based streaming media (e.g., Netflix). One study (Vaala et al., 2010) investigated language strategies (e.g., syntax and grammar) in infant-directed videos, whereas a few others (e.g., Alwitt, Anderson, Lorch, & Levin, 1980; Calvert, Huston, Watkins, & Wright, 1982) examined preschool children’s visual atten-

tion to specific attributes of TV programming (including language). To fill this gap, the current study explored both musical and linguistic components from a corpus of randomly selected episodes broadcast on infant-directed TV.

The Study

The current study used one of the first TV channels directed at babies, infants, and toddlers as the cradle for soundscape analysis. Launched in 2003 (in Israel), BabyTV quickly gained international attention as a platform whereby infants were exclusively targeted as a viewer audience (Carvajal, 2008; Elias & Sulkin, 2017; Fuenzalida, 2011). Lemish (1987) originally called this group *viewers in diapers*. In 2007, News Corp’s Fox International Channels acquired a major stake in BabyTV, placing it alongside their other primetime programming distributed worldwide. In March, 2019, the Walt Disney Company acquired 21st Century Fox. Although the employment of an exclusive single channel might be seen as a limitation, BabyTV is distributed in excess of 100 countries, broadcast in over 18 languages, continuously throughout the day—every day, 7 days a week. BabyTV’s official Internet site claims that programming is structured on nine overriding cross-cultural developmental themes enhancing early learning skills and milestones. These are: First Concepts; Nature and Animals; Music and Art; Imagination and Creativity; Building Friendships; Songs and Rhymes; Guessing Games; Activities; and Bedtime.

Methodology

Stimuli. Initially, a list of all 45 series broadcast on BabyTV channel (in Israel) was tabulated. To ensure international relevance, these were verified as available online (e.g., YouTube) in the English language. Subsequently, six series were dropped. The final corpus was comprised of 39 series. See Table 1. The majority (82%) are animations (2D = 49%, 3D = 33%); 10% feature puppets, 8% integrate animated/puppet characters with human

Table 1
Corpus of Televised Series Broadcast on BabyTV Channel

1. Baby Chef	21. Mitch Match
2. Baby Farmers	22. Nico And Bianca
3. Baby Giants	23. Night Series
4. Bath Tubbies	24. Oliver
5. Big Bugs Band	25. Pim And Pimba
6. Billy and Bam Bam	26. Pitch And Potch
7. Charlie and The Numbers	27. Play Time
8. Crafty Rafty	28. Popiz
9. Crystal Ball	29. Snowies
10. Cuddlies	30. The Bonbons
11. Danny and Daddy	31. Tiny Beats
12. Draco	32. Tipa Tupa
13. Dream With Kim	33. Tukey Tales
14. Egg Birds	34. Tulli
15. Hungry Henry	35. Vegibugs
16. Jammers	36. Walter And Dude
17. Kenny And Gurie	37. Who’s It What’s It
18. Lily And Pepper	38. Yoyo The Magician
19. Little Ball And Little Chick	39. Zoe Wants To Be
20. Mice Builders	

Note. The series are presented in ascending alphabetic order.

performers, 5% feature material figures, and one series features human actors.

Measures. To our knowledge, no other means exists to appraise music and language constituents of infant-directed TV programming or to determine the age-related appropriateness of song materials of infant-directed programming. Therefore, two measures were developed.

Soundscape Appraisal of Broadcast Series. The *Soundscape Appraisal of Broadcast Series* (SABS) is a descriptive catalogue used to assess sound-related features in episodes of a broadcast series for young children. The SABS comprises two principal components totaling 13 items: musical constituents ($n = 9$) and language constituents ($n = 4$). The musical constituents account for musical features found in the episode (0 = *absence*; 1 = *presence*). The musical features are (1) instrumental music as an introductory opening theme, (2) instrumental background music as dramatic material, (3) instrumental music as the final closing theme, (4) song as an introductory opening theme, (5) song as dramatic material, (6) song as the final closing theme, (7) singing games (i.e., song accompanying movement sequences) as dramatic material, (8) declamation rhymes as dramatic material, and (9) sound effects (e.g., bell ring, whistle blow, drum beat) as dramatic material. The linguistic constituents account for linguistic features found in the episode (0 = *absence*; 1 = *presence*). The linguistic features are (10) prosodic utterances and linguistic-like gibberish (e.g., “taka taka” or “uuua boooobo”), (11) enunciated comprehensible words, (12) spoken language by an unseen narrator (offering articulated commentary or dialogue), and (13) absence of linguistic features altogether (scored “1” if linguistic features 10–12 are scored “0”).

Sulkin Infant Song Inventory. The *Sulkin Infant Song Inventory* (SISI) is a criterion-based checklist that measures age-appropriateness and developmental fitting of song materials. The SISI documents 10 universal characteristics typically found in young children’s songs (Pai, 2009; Sulkin, 2003, 2009; Sulkin & Brodsky, 2015). The SISI accounts for features (0 = *absence*; 1 = *presence*) found in a song. The musical features are (1) simple transparent cyclic structures (e.g., AB—A'B—A''B etc.), (2) naive repetitive rhythmic patterns (e.g., ta ta ti-ti ta ♩ ♩ ♩), (3) narrow pitch ranges (e.g., C4–G4), (4) tight stepwise intervals (e.g., 2^{nds} & 3^{rds}), (5) recurring melodic motives, (6) single melodic lines with unadorned harmony, (7) moderate performance tempos (e.g., <120 bpm), (8) short repeated texts, (9) returning syllables and words (e.g., “Baa Baa black sheep . . .”), and (10) extensive use of rhymes. The SISI uses an accumulative 10-point index, whereby scores 1 to 3 would be considered developmentally inappropriate, 4 to 5 would be considered weakly beneficial for optimal development, 6 to 7 would be considered of medium developmental benefit, and 8 to 10 would be considered as highly developmentally appropriate songs for infants and toddlers. It should be noted that these cutoffs were conceptually derived based on a logical division as opposed to reflecting a more systematic approach.

Procedure. The soundscape analysis was carried out by the second author; she is a composer of children’s songs, a music educator for Grades K–6, a college lecturer, and researcher of early childhood music development. Three episodes of each series in the corpus were digitally recorded and reviewed in entirety (117 episodes, 410 min). A preliminary evaluation of the episodes demonstrated a significant replication of all structural patterns in

each episode of the same series. Namely, if no song with comprehensible language appeared in one episode, then the same was true for all other episodes of the same series; if a song or linguistic feature appeared at a specific scene placement in one episode, then the same was true for all other episodes of the same series. Such a finding implied that a comprehensive appraisal of one episode per series would provide ample information for a reliable soundscape analysis of the corpus. Subsequently, one randomly selected episode of each series was viewed five times (195 episodes, 682.5 min) using the SABS and the SISI for coding. The tempo of each song was measured. Details were logged for each episode, including a short narrative synopsis of the content and plot, along with six other descriptives: (1) music genre; (2) music motives and phrases; (3) music instruments and arrangements; (4) reference of series name or characters in opening figures; (5) representational sex/age of narrators; and (6) inclusion of *baby talk* (e.g., speech imprecisions, mispronunciations, and inaccuracies of syntax and grammar).

Given that the data above was generated by a single judge employing assessment measures that have not yet been validated elsewhere, a post hoc *interrater agreement analysis* (IRA) was carried out employing a random sampling of five series with two independent external judges blind to the goals of the study, joined by the second author as a third judge in the analysis. The judges were two elementary school music teachers recruited at random from a list of certified music teachers residing in central Israel. The judges were female, early childhood music specialists (BMusEd), between 31 and 35 years of age ($M = 33$, $SD = 2.82$), with an average nine years ($SD = 1.41$) teaching experience in public kindergartens for children aged 3–36 months.

Results

Soundscape Appraisal of Broadcast Series. The SABS data indicated that instrumental music accompaniment was the most common soundscape feature broadcast on BabyTV; songs were less common (see Table 2). As can be seen in Table 2, 30 series (77%) used instrumental music as introductory opening themes, and nine (23%) used songs for the same purposes. Further, 36 series (92%) employed instrumental music as final closing themes, and three (8%) used songs for the same purposes. All series (100%) used instrumental music during the drama, but just six (15%) contained a song as part of the dramatic plot content. Singing games were found in two series (5%); declamation rhymes were not found at all. As can be seen in Table 2, 16 series (41%) employed prosodic utterances and linguistic-like gibberish, whereas 11 (26%) promoted comprehensible spoken language. Overall, 32 series (82%) included a sequence of events that can be considered a structured dramatic plot, whereas the other seven series (18%) presented ‘slices’ of animated events.

Instrumental music for opening and closing of series. The instrumental music presented as introductory and closing themes consisted of arrangements in various music styles, including Light-Pop, Jazz, Classical, Ethnic/World (African, Indian, Mexican Mariachi), and country-western genres. More than two thirds of the introductory refrains did not provide a reference to the name of the series or the characters in the episode; the closing themes were identical to opening refrains albeit abridged. For the most part (87%), closing themes were instrumental (even if an introductory

Table 2
The Soundscape Appraisal of Broadcast Series

Soundscape features	<i>N</i> ^a	PPR	95% CI
Music constituents			
1. Use of instrumental background music as introductory opening theme of episode	30	0.769	[0.607, 0.889]
2. Use of instrumental background music as dramatic material during episode	39	1.000	[0.910, 1.000]
3. Use of instrumental background music as final closing theme of episode	36	0.923	[0.791, 0.984]
4. Use of song as an introductory opening theme of episode	9	0.231	[0.111, 0.393]
5. Use of song as dramatic material during episode	6	0.154	[0.059, 0.305]
6. Use of song as the final closing theme of episode	3	0.077	[0.016, 0.209]
7. Use of singing-games as dramatic materials during episode	2	0.051	[0.006, 0.173]
8. Use of rhymes as dramatic materials during episode	0	0.000	[0.000, 0.090]
9. Use of sound-effects as dramatic materials during episode	39	1.000	[0.910, 1.000]
Language constituents			
10. Use of prosodic utterances and linguistic-like gibberish during episode	16	0.410	[0.256, 0.579]
11. Use of spoken verbal language by the characters themselves during episode	10	0.256	[0.130, 0.421]
12. Use of spoken verbal language by a narrator during episode	11	0.282	[0.150, 0.449]
13. Show-series without linguistic features	12	0.308	[0.170, 0.476]

Note. PPR = proportion positive results; CI = confidence intervals.

^a *N*_{Total} = 39.

refrain had been a song); two series did not present a final closing theme.

Instrumental music and sound effects as dramatic materials. All series included both background music and sound effects. For the most part (92%), the dramatic materials were digitally synthesized sounds. This production strategy allowed for a wide variety of sonorities: strings (banjo, cello, double bass, guitar, harp, violin), percussion (bells, claves, cymbals, drums, guiro, xylophone), keyboards (piano, organ), and winds (digeridoo, flute, oboe, saxophone, whistle). Further, two strategic formats for coordinating background music as dramatic materials surfaced. The most prevalent use of music accompaniment (72%) was to change music pieces per scene, yet no coherent musical progression between the pieces existed, but rather a scatter of short phrases characterized by quick jagged changes in harmony, rhythms, and melodic motives. Alternatively, other series (28%) used a single piece of music throughout the whole episode regardless of the plot, albeit an occasional sound effect to underscore dramatic content was inserted.

Songs with lyrics as dramatic materials. The soundscape analysis found that the number of songs in the corpus was far less than expected. Half of the series (51%) used a song; of these, nine (23%) used a song as an introductory theme, three (8%) used a song as a closing theme, and eight (21%) used a song as dramatic material. Among the eight songs analyzed (see the *SISI* in the following text), two used gibberish, and six used comprehensible language.

Linguistic features used within programs. Gibberish and intonations were the most dominant (41%) vocal means of communications in the corpus. Almost a third (31%) were void of linguistic features all together; namely, the characters did not verbally communicate between themselves. Further, a third of series (32%) used a narrator to transform incoherent animation (e.g., nonverbal communication, gibberish, or intonations) into more comprehensible language; of these, three featured a narrator without other character voices heard, whereas two featured a narrator with voices from characters. Five series presented an adult male-voice narrator, four presented an adult female voice, and two presented a

childlike voice. Only one quarter (26%) of the series used spoken language in the program; four of these presented language inaccuracies as if imitating stereotypical speech oddities of young children (e.g., grammatical imprecisions, syntax errors, phonological mishaps, and talking in the third person).

Sulkin Infant Song Inventory. The corpus of series broadcast on BabyTV consisted of few (*n* = 17) songs. One song (6%) was scored as developmentally inappropriate (*SISI*_{Mscore} = 3), four (24%) were scored as weakly fitting the age group (*SISI*_{Mscore} = 4.25, *SD* = 0.50), seven (41%) were scored as adhering to a medium fit (*SISI*_{Mscore} = 6.72, *SD* = 0.49), and five (29%) were scored as highly developmentally appropriate (*SISI*_{Mscore} = 8.6, *SD* = 0.89) for infants and toddlers. Taking a broad view, nearly a third (30%) of all songs presented in the corpus were deemed developmentally inappropriate, as they might not allow infants or toddlers to actively participate in the performance (i.e., reproducing the musical or linguistic screen content). See Table 3. As can be seen in the table, although some of the individual components are developmentally appropriate, when assessing the overall fitting of the song, the indication is otherwise. When analyzing textual content of the songs, only three (18%) consisted of short repeated texts, five (29%) employed rhymes, eight (47%) were performed at a moderate pace, and nine (53%) contained texts constructed with repeated syllables and words. In short, the songs broadcast on BabyTV do not necessarily employ age-appropriate linguistic features such as repetition (of syllables, words, sentences, or rhymes), nor are they reproduced at a tempo/pace fitting the capabilities of infant- and toddler-viewers.

Interrater Agreement Analyses

It should be pointed out that the literature debates the correct method to measure agreement and reliability among raters and judges. Costa-Santos, Bernardes, Ayres-de-Campos, Costa, and Costa (2011) claim that much of the confusion around “agreement estimation” versus “reliability coefficients” relates to ambiguity among conceptual underpinnings. Accordingly, agreement estimation (interrater agreement analyses [IRA]) questions whether or

Table 3
The Sulkin Infant Song Inventory

Characteristics	N^a	PPR	95% CI
1. Transparent simple cyclic structure	10	0.588	[0.329, 0.816]
2. Naïve repetitive rhythmic patterns	14	0.824	[0.566, 0.962]
3. Narrow pitch range	17	1.000	[0.805, 1.000]
4. Tight stepwise intervals	17	1.000	[0.805, 1.000]
5. Recurring melodic motives	12	0.706	[0.444, 0.897]
6. Melody lines with unadorned harmony	15	0.882	[0.636, 0.985]
7. Moderate performance tempo	8	0.471	[0.230, 0.722]
8. Short repeated texts	3	0.176	[0.038, 0.434]
9. Returning syllables and words	9	0.529	[0.278, 0.770]
10. Extensive use of rhymes	5	0.294	[0.103, 0.560]

Note. PPR = proportion positive results; CI = confidence intervals.

^a $N_{Total} = 17$.

not judgments are similar (i.e., identical scores). Namely, in this case the absolute degree of measurement error (ME) is of interest. On the other hand, reliability coefficients are typically defined as the ratio of variability between judgments of the same subject or artifact by different raters, in relation to the total variability of all scores in the sample. Long ago, Hartmann (1977) noted that reliability provides information about the utility of scores to distinguish between subjects or artifacts, and explained that reliability coefficients will be low when there is little variability among the scores. For these reasons, the percentage of absolute IRA of a binary task using categorical observational data (absent/present) was employed.

The judges signed consent forms, received oral instructions, and engaged in a 20-min training procedure to become acquainted with the *SABS* and the *SISI*. Then, the three judges watched five randomly selected episodes of the same series used in the main study (listed in Table 1). None of these five episodes were among the same episodes used in the main study. In a similar fashion as used in the main study, each episode was viewed five times using the *SABS* and the *SISI* for coding. It should be noted that only three out of five episodes included a song. Thus, the *SABS* was used for all five episodes, whereas the *SISI* was used for three episodes. The task took a total 150 min.

IRA is the level of agreement between pairs of judges. The number “1” was entered for *agreement* and “0” for *disagreement* for each item of the *SABS* and the *SISI*, per episode, respectively, for each judge. In this procedure, the number of agreements is divided by the total number of observations. Although the limitation of this method is that chance agreement is not accounted for in the analyses, by employing binary categorical scoring (i.e., features are either absent or present), there seems to be little room for chance (Bajpai, Bajpai, & Chaturvedi, 2015; Graham, Milanowski, & Miller, 2012). Thereafter, a mean fraction of agreement was converted to a percentage as the indicative level of the absolute agreement between the raters. The analysis found that agreement estimates for the *SABS* (IRA = 98.97%, ME < 2%) and the *SISI* (IRA = 91.10%, ME < 10%) was very high—especially when the standard benchmark for IRA of more than two raters judging more than four artifacts is “acceptable” at levels of 75% agreement with a measurement of error of 25% (Bajpai et al., 2015; Costa-Santos et al., 2011; Graham et al., 2012).

Discussion and General Conclusion

The current study explored a corpus of 39 series broadcast on the BabyTV channel under the auspices of the Walt Disney Company. The study investigated both musical and linguistic constituents while accounting for benchmarks of well cited normative child development indicating abilities to interact with the screen.

The most dominant musical features found in the episodes were instrumental music and sound effects. Foremost, we consider the opening themes of the episodes: the purpose of an introductory theme is as a signal to viewers that a program is about to begin. Lemish (1987) noted that upon hearing the opening measures of a musical theme young infants and toddlers quickly crawled, walked, and even ran toward the TV screen to view favorite programming. Although children are able to recognize an opening signature tune associated with a particular series, as these were exclusively instrumental it is unlikely that they would interact with them. Hence, it seems that the functional purpose of such materials is to supply cues and clues for young viewers. Nonetheless, introductory openings could have also supplied the name of the series and/or the names of the characters; the absence of words in introductory opening themes may diminish young viewers attempts to comprehend content. This finding raises questions as to whether production team members understand the cognitive needs of young children.

Second, we consider the function of instrumental material used to close episodes. Perhaps the greatest significance of a final musical theme is to simply serve as a *finale*. A finale emotionally prepares for closure; it signals to viewers that they are about to experience the end of programmed content. Yet, some series in the corpus did not incorporate closing themes at all, and while it is likely that even toddlers would notice that the visual content has changed, without a formal ending, young viewers might be left without any inkling as to what happened.

Finally, we consider the instruments used in the series. The findings show that sounds heard were exclusively digitized reproductions of musical instruments. Although such a means offers a wide array of resonant qualities, no previous research evidence exists to support a notion that synthesized timbres are beneficial for babies, infants, or toddlers. Nor is there any empirical verification that digitized sonorities are developmentally more suitable

than genuine acoustic instruments. Music development experts recommend exposure to a variety of sounds during early childhood, but nonetheless they endorse authentic music representations more than artificially generated tones to enhance affective involvement (Merkow & Costa-Giomi, 2014).

The current study found that songs appeared to a much lesser extent than one would have expected for a broadcast platform targeting babies, infants, and toddlers. For example, the number of songs used in the dramatic content was infrequent ($n = 8$, 20%). Further, playsongs rarely appeared in the series ($n = 2$, 5%), and the series were totally void of declamation rhymes. The absence of songs reveals a diminished use of music as a developmental platform. Research evidence has shown that songs are vital for general child development, and that songs encourage young children to attend to televised content as well as interact with the screen (Barr & Wyss, 2008; Calvert, 2001; Calvert & Tart, 1993). The current findings show that even when playsongs appeared in the series, they were reproduced at accelerated tempos; although fast-paced songs might potentially draw viewers' attention, it might also cause them to lose much of the actual content. Such incompatibility in the series was especially potent when the animated figures performed movements beyond young children's natural developmental abilities such as quick vertical jumping motions and fast body-twirling rotations. Moreover, playsongs appearing in the series were always reproduced by animated figures, whereas previous research has demonstrated that infants and toddlers are more likely to imitate screen content when performed by human actors with whom they can identify with (Krcmar, 2010; Lauricella, Gola, & Calvert, 2011). Finally, the study found that the songs heard in the series do not employ short repeated texts, returning syllables, or recurring words; not even one episode contained a declamation rhyme.

The findings point out that the linguistic components of the broadcast seem to be irregular and developmentally inappropriate. Although they elicit children's attention, they offer little language learning as the series use a considerable amount of gibberish prosodic utterances and intonations, rather than intelligible language that could be recalled, and subsequently reproduced in other everyday contexts. We note that even episodes that used verbal language contained a host of inaccuracies and stereotypical speech oddities including grammatical imprecisions, syntax errors, phonological mishaps, and talking in the third person.

Looking at the wider picture, we cannot but raise questions about impact: What happens to young infant and toddler viewers when no mediation is offered to explain the screen content? This is especially pertinent when accounting for the popular discourse concerning screen exposure as being detrimental for linguistic abilities and skills (Tanimura, Okuma, & Kyoshima, 2007; Zimmerman et al., 2007a, 2007b). We wonder if it is possible that the employment of developmentally appropriate designed linguistic content could have a more positive influence on babies, infants, and toddlers development—and perhaps even help decrease the video deficit effect? In the case of BabyTV, explicit declarations about series claim that it provides learning-oriented content for babies, infants, and toddlers:

We therefore put together a dynamic team of content experts and childhood experts and created the first television channel adapted to the needs and abilities of growing babies and toddlers. . . . We know

how important it is for parents to have safe and effective tools for learning and for play with their youngest child and this is what we endeavor to do. . . . Our main focus is to develop high quality series that are designed to promote learning, activity and interaction in a fun environment. . . . (<https://www.babytv.com/aboutus.aspx>)

Perhaps this declaration is more of a commercial advertisement and marketing strategy to entice parents than an actual description of the broadcast programming itself?

At this juncture, we ask the following: Why are the musical and linguistic constituents designed the way they are? Certainly, the creators and producers of the series found on BabyTV are experts. Yet, perhaps in the highly competitive media saturated environment of year 2020, whereby babies, infants, and toddlers are exposed on a daily basis to screen content, production teams assess programming for young audiences incorrectly. Namely, it would seem that media production teams too often compromise the aural contents of screen content—and this is apparent even when accounting for the more fashionable production culture known as *edutainment*. We do not ignore the fact that producing broadcast content for babies, infants, and toddlers is ultimately a business, and decisions regarding programming consider many facets—not the least of which is distribution. Given that BabyTV is viewed in over 100 countries, one reason why instrumental pieces are much more abundant in the corpus than songs, is simply because instrumental music does not require translating lyrics/texts into multiple languages. The same reasoning applies for the use of gibberish, prosodic utterances, and intonations, which have no cultural or regional attribution, and hence do not require translation as does spoken language. Further, when spoken language is presented by an off-stage narrator, there is no requirement of *lip-syncing*. Nonetheless, even when considering all of these, we still feel that it is imperative for creators, designers, and producers of infant-directed screen content to enlist a host of specialists from fields such as child development, education, and music psychology, in a much more meaningful way in the best interests of young viewers.

We have already acknowledged that one main limitation of the current exploration is the employment of a single corpus. Certainly, future studies are needed to validate the current findings among a more comprehensive body of programs beyond what is broadcast on BabyTV. Moreover, other studies using the *SABS* and the *SISI* are necessary to assess the effectivity of the measures. Finally, empirical observational studies are required to document the actual behavior of infants and toddlers while viewing screen content.

In conclusion, we are hopeful that collaboration will improve between the various writers/designers/producers of infant-directed programs and developmental specialists. This partnership will no doubt contribute to create more age-appropriate screen content. Such an alliance will enhance our efforts to drive optimal development of behavior, by providing a more nurturing digital screen environment and viewing experience for babies, infants, and toddlers.

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