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Infant-directed Media: An Analysis of Product Information and Claims

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Infant DVDs typically have titles and even company names that imply some educational benefit. It is not known whether these educational claims are reflected in actual content. The present study examined this question. Of 686 claims (across 58 programs) listed on packaging, websites and promotional materials, implicit claims were most frequent (37%) followed by uncodable/vague claims (25%), a list of included content (24%), and explicit claims (14%). The most frequently targeted educational domain was general knowledge claim (32%), followed by language/literacy claim (29%), social–emotional claim (15%), physical claim (12%), and cognitive development claim (12%). Number of claims in a domain was positively associated with the percentage of scenes featuring that domain content (Mean $r = 0.52$), indicating a moderate degree of match between claims and DVD content. Overall, both claims and content were disproportionately targeted to language and general knowledge content areas, relative to social, physical and cognitive domains. Even when claims are developmentally appropriate, there is some difficulty in translating of producer claims into educational DVD content.

Key words: infant; media; content analysis; producer claims; early learning guidelines

Despite recent recommendations to avoid screen media exposure for children under the age of two (American Academy of Pediatrics, 1999), infants between 6 months and 3 years are exposed to an average of 1–2 hours of television per day, frequently via prerecorded infant-directed television programs specifically designed for children under two that are marketed to their parents (Barr, Danziger, Hilliard, Andolina, & Ruskis, 2010; Rideout & Hamel, 2006; Rideout, Vandewater, & Wartella, 2003; Zimmerman, Christakis, & Meltzoff, 2007a, 2007b).

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Recent surveys found that families with children under the age of two own on average 5–6 infant-directed videos/DVDs (Barr *et al*., 2010; Zimmerman *et al*., 2007b), with infant media representing a multi-billion dollar per year industry (Garrison & Christakis, 2005).

Although these infant-directed media programs are often marketed as educational, empirical investigation of such claims has been limited (Garrison & Christakis, 2005). One notable exception is a report produced by Garrison and Christakis (2005) that examined educational claims made by producers of media (DVDs/Videos, computer games, and consoles) designed for children aged 0–6 years. This report, which included a survey of the 100 best-selling infant-directed DVDs (specifically marketed for infants aged 0–2) listed on Amazon.com in 2005, found that 76 of these products made one or more educational claims. The majority of product claims were related to broad domains such as cognitive, physical, and social–emotional development, rather than a specific lesson outcome. It should be noted that many of the products included in this list of top-selling infant DVDs were part of the same series. For example, 26 were from the Baby Einstein series, and 18 were from Nick Jr. Garrison and Christakis more extensively examined a representative subsample of 11 popular DVDs, 7 that specifically targeted children between the ages of 0–3 (3 of the subsample of 11 videos did not list a target age range, while another targeted preschool children aged 3–6). Of these 7 infant-directed DVDs, 3 contained claims that specifically mentioned promoting babies' social–emotional development or parent–child interactions. In addition, all contained some type of suggestion or instruction to parents (either on packaging or supplemental voiceover narration) regarding how to use the DVDs with their infants to facilitate interactions (Garrison & Christakis, 2005). This report was a first step in examining the educational assertions made by producers of infant-directed media products, but it did not provide a detailed analysis of corresponding video content.

Extensive research examining the efficacy and content of educationally oriented programming for preschool-aged children indicates immediate and long-term cognitive gains following exposure to programs such as *Sesame Street* (Anderson, Huston, Schmitt, Linebarger, & Wright, 2001; Ball & Bogatz, 1970; Bogatz & Ball, 1971; Wright *et al*., 2001), *Blue's Clues* (Anderson *et al*., 2000; Linebarger & Walker, 2005), and *Dora the Explorer* (Calvert, Strong, Jacobs, & Conger, 2007; Linebarger & Walker, 2005). The positive child outcomes depend upon the deployment of effective teaching strategies and age-appropriate content. The determination of measurable age-appropriate content and strategies in turn depends upon detailed content analysis. Such gains are further enhanced via positive interactive coviewing with parents (Cook *et al*., 1975), suggesting that a combination of quality educational content and interaction with caregivers provides an optimal environment for learning from screen media early in development.

In contrast to the many preschool- and school-age-directed media products that have been carefully content analysed and subsequently linked to learning (e.g. Calvert, 2008; Jordan, Schmitt, & Woodard, 2001; Wilson, Kunkel, & Drogos, 2008), infant-directed media has not received such rigorous examination of program content. This lack of attention is the result of three factors: (1) the broadly thematic nature of infant media content may make it difficult to target lesson outcomes in a content analysis (e.g. Garrison & Christakis, 2005); (2) unlike educational preschool on-air programming, there is no regulation of infant-directed pre-recorded media (Calvert, 2008); and (3) there is a general lack of specific educational curriculum for children 3 years of age and under.

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Recently, however, Scott-Little, Kagan, Frelow, and Reid (2008) conducted a content analysis of infant–toddler early learning guidelines (ELGs) published by 21 individual states (80% target families directly). The analysis focused on five educational domains: physical development and motor skills, social and emotional development, language and literacy, cognitive development, and general knowledge. Each domain was then broken down further into subcategories, for a total of 68 indicators across the five domains. We adapted these guidelines to assess the content of infant-directed media.

The Present Study

Despite extensive research examining the educational content of programs designed for preschoolers, grade-schoolers, and adolescents (e.g. Jordan, 1996; Jordan *et al*., 2001), no such detailed content analyses exist for television programs designed for infants. The first goal of the present study was to examine the educational claims made by producers. Based on prior research (e.g. Garrison & Christakis, 2005; Linebarger & Walker, 2005) and an increased public emphasis and 'sense of urgency, even panic, over what young children needed, when they needed it, and what could happen if they didn't get it' (Zigler, Finn-Stevenson, & Hall, 2002; p. 195; see also Carnegie Task Force on Meeting the Needs of Young Children, 1994; Puckett, Marshall, & Davis, 1999), we expected to find a large number of claims targeting learning and early development within the five educational domains. Packaging and claims are particularly important to examine in infant-directed products because these products are not aired commercially and because parents report that 'educational' DVDs are important for their very young children's development (Garrison & Christakis, 2005). Next we assessed the prevalence of educational content in infant-directed programs by examining content across the five educational domains outlined above: physical development and motor skills, social and emotional development, language and literacy development, cognitive development, and general knowledge. Given the lack of explanation from producers regarding the organization of content presented in infant-directed videos, the documentation of content areas that apply to children in real life settings is an appropriate starting place. Although there is no existing research base to inform a hypothesis regarding the relation between the number of educational claims made by producers and the amount of corresponding content, we expected educational content in the videos to match the educational claims made by producers.

METHOD

Sample

Following the procedure used by Garrison and Christakis (2005), an Internet search was conducted for all DVDs available for children under the age of three, using popular retail sites (e.g. Amazon.com) and search engines (e.g. Google). Based on the results of this search, a comprehensive and exhaustive list of all commercially available English language DVDs produced in the US that specifically targeted babies and toddlers aged 0–3 between Fall 2007 and Spring 2008 was compiled ($n = 215$ DVDs). All companies found in this search were included in the final sample ($n = 31$ different companies).

With the exception of five individually marketed infant DVDs, the majority of videos produced for infants were part of a series of two or more products

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(i.e. number of products per series ranged from 2 to 35 DVDs; $M = 8.1$; median = 5). For each of these 26 series, two video titles were randomly selected for inclusion in the final sample by drawing them from a hat. One randomly selected video product came packaged as two separate DVDs and therefore three products from this series were included in the final sample of 58 videos (See Goodrich, Pempek, & Calvert, 2009, for further description). Though we did not apply any exclusionary criteria with regard to the presence of claims, endorsements, or similar language on packaging, websites, and promotional materials, all of the videos randomly selected for analysis contained at least one of these features.

Content Analysis Coding Strategy

Two coding schemes were developed to assess educational claims and content. Claims and related information (e.g. titles, target age, educational consultants) were first coded from product materials. Product materials were defined as any packaging, promotional materials, and associated websites of infant-directed programs. Next, the general structure and educational content of the videos was coded using *scene* as the unit of analysis. A scene was defined as one physical location where some action takes place ($N = 6791$ scenes). From these two codes, we linked educational claims about a product to presented educational content by domain for all scenes in a DVD. In addition, using discrete operational definitions for different claims, we also matched specific aspects of the educational claim to the DVD content.

Educational Claims: Coding Product Materials

Educational title: Titles were coded based on the degree of implied learning reflected in the title language using a three-point scale (i.e. high degree of implied learning, medium/low, or neutral). Titles ranked as high included one or more words that suggested mastery, skill, or learning in a specific domain (e.g. *Your Baby Can Read, My Baby Can Talk*). Those marked as medium/low contained one or more words that suggested exploration, introduction, or a specific activity in a given domain (e.g. *Sesame Beginnings*: *Make Music Together, Baby Pro*: *Let's Dance and Tumble*). Titles rated as 'neutral' did not contain any words that suggested learning (e.g. *Baby Road Trip*: *City, Little Playdates*: *Critter Friends*).

Target age: Target age was the specific age range specified by product materials.

Age span: Age span reflected the total number of years indicated by the target age: (1) product did not list a target audience; (2) product listed ages spanning 2 years or less (e.g. 9 months–24 months); (3) product listed an age span of 2–5 years (e.g. 0–36 months); (4) product listed no end range at all (e.g. for 6 months and up); or (5) product listed words to represent an age range (e.g. for babies and toddlers).

Child's mode of interaction: Mode of interaction was determined both by directions found in product materials and by viewing the product and was coded in one of two ways. *View only* was defined as no specific recommendations to view alone or with someone. *View with participation elicited* was defined as specific response elicitations by characters or narrators as well as specific visual or verbal statements contained in product materials that indicate children should participate with or interact with onscreen characters or that prompt parents to view and participate with their children.

Repeat or continuous play: Coders indicated whether or not there was an option for automatic repeat of the program.

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Company produced supplemental educational material/information: Coders scored if the company or producer website: (1) provided links to materials that were written or created by the company such as a parent guide to media viewing or flashcards, (2) whether the product included extra information regarding the educational value of the content, or (3) provided tips and strategies for co-viewing. Coders made note of specific supplemental educational materials and how to access the materials (e.g. product website, bonus DVD features). Materials created by parents (e.g. documents available via a parent blog on the website) were not included.

Awards or honors: Coders indicated whether or not product materials including the packaging and website mentioned any awards received by the company (e.g. parent's choice).

Endorsements: Coders indicated whether or not product materials listed endorsements from individuals or groups (e.g. National Education Association, academics or industry leaders). Coders recorded who endorsed the product (e.g. an expert, a parent) and their qualifications or credentials (i.e. degrees held, fields worked in, experience with children). This category did not include testimonials made by parents on discussion forums within the product's websites or any other affiliated websites (e.g. Amazon reviews).

Mention of research: When product materials specifically referenced research in an area such as developmental psychology or education, coders listed where the information was found (e.g. website or back of DVD or cover) and transcribed what was said verbatim. It was also noted whether the research mentioned specifically involved the product or whether it was taken from pre-existing research findings related to similar products or its content.

Claim information: Coders examined product materials for educational claims made about each product. An educational claim was defined as visual or verbal content suggesting that exposure to this media product 'can assist children in learning important information, skills, values, and behaviour while entertaining them and exciting their curiosity to learn about the world around them' (Children's Television Act, 1990; p. 303a). For example, a company might claim that their product introduces babies to colors, shapes, and letters or teaches its viewers vocabulary. All claims were transcribed verbatim and further coded across three separate categories: (1) behavioural claims and verb, (2) type of claim, and (3) operational definition. A single statement or sentence could contain multiple claims, each of which was coded separately; for example, a statement such as 'increases self esteem while developing vocabulary', would be coded as two separate educational claims (a social–emotional claim and a language claim) with two separate operational definitions (i.e. self-esteem, vocabulary).

Behavioural claims and verb: Behavioural claims were coded into one of four mutually exclusive categories based on whether claims included a vague learning outcome (*general*), implied learning goals (*implicit*), specific learning goals (*explicit*), or listed specific DVD content (*explanatory*).

General claims were claims where the learning goal was unclear and the targeted educational domain was very large or quite broad. For example, the product was 'thoughtfully created to nurture cognitive, sensory, and emotional developments throughout your baby's first years'. General claims commonly stated that a product would 'promote' or 'inspire' development in a broad area of development (e.g. cognitive). Without a specific reference to the aspect of cognitive development targeted, the claim was too expansive and unable to be linked to specific educational domains. Claims that were

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designated as general were not coded for domain and were not given an operational definition.

Implicit claims implied learning goals using non-specific language including verbs such as 'explore' and 'introduce' paired with a specific behaviour or educational domain (e.g. *'inspiring* early language development—from simple gestures to first spoken words').

Explicit claims used behaviourally specific verbs (e.g. teach, instruct) and specific behaviours or educational domains such as *'teaches* number recognition and order for numbers 6 to 10'.

Explanatory statements were statements that listed specific DVD content in the absence of verbs or any implied learning outcomes such as 'includes music, letters, shapes, and colors' or 'highlights sorting, forming categories, and sequencing events'.

Kind of claim: Each claim categorized as an implicit, explicit, or explanatory statement was then coded for the educational domain targeted. The domains identified by Scott-Little *et al*. (2008) were adapted for the purposes of this content analysis and included social–emotional development (e.g. prosocial behaviour); cognitive development (e.g. problem solving); language and literacy development (e.g. vocabulary, alphabet); motor development (e.g. fine motor skills), general knowledge (e.g. colors, animals); and 'unclear' (did not fit into any of five educational domains).

Operational definition: To further break down the educational content targeted, the educational domains were further subdivided into more specific categories using operational definitions (e.g. alphabet awareness) from Scott-Little *et al*. (2008). The list of operational definitions was used to assign a code to each specific learning outcome, goal, or behaviour associated with each claim. Ten additional operational definitions (e.g. music) were added to Scott-Little's original definitions for a total of 78 operational definitions to encompass the variety of claims found across the 58 DVDs. For coding purposes, each operational definition was assigned a number ranging between 1 and 78 (definitions 1–15 physical development, 16–29 social-emotional development, 30–52 language and literacy, 53–68 cognitive development, and 69–78 general knowledge). For example, specific physical developmental operational definitions included 4 (sports) and 10 (gross motor skills); social development operational definitions included 23 (feelings of others) and 28 (social skills with peers); language and literacy operational definitions included 42 (vocabulary and linguistic concepts) and 51 (alphabet awareness); cognitive development operational definitions included 63 (exploratory play) and 67 (problem solving); and general knowledge operational definitions included 76 (knowledge of objects in the physical world) and 78 (mathematics).

Claim readability: The approximate years of education needed for a reader to understand the claim used in the educational claims was calculated using the Automated Readability Index (ARI; Smith & Senter, 1967).

DVD Content Coding

General structure of DVDs

Show format: Show format described the format used for the majority of the product as a whole (i.e. over half of the time): *live action, puppets/muppets, animated*, and *mixed*. Those marked as 'mixed' were a combination of two or more categories.

Program continuity: Each product was coded for overall level of continuity. Magazine formats (low continuity) were distinguished from thematic magazine

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formats (medium continuity) and narrative formats (high continuity; see Wright *et al*., 1984). The 'narrative format high continuity' required 'temporal integration of successive scenes for full comprehension' (Wright *et al*., p. 653). The 'magazine format medium continuity' captured products comprised of two or more long segments that were somewhat independent but held together by a common theme (e.g. seasons of the year). The 'magazine format low continuity' was defined as a number of short segments that were unconnected by a common theme.

Video content coding: *educational domains of DVD content*

Each video in the sample ($N = 58$) was first coded into scenes to parse the content into meaningful units for analysis (see Goodrich *et al*., 2009). This coding provided a time-stamped structure for all subsequent coding of educational domains. Independent of claims, each scene was coded with an educational domain, using a structure similar to the criteria adapted from Scott-Little *et al*. (2008). Educational domains were coded based on the dominant type of content featured per scene: *General Knowledge* included a broad range of general educational content such as colors, basic math concepts (counting, naming numbers), knowledge about animals, and the seasons. *Cognitive Development* included content related to executive functioning skills such as problem-solving, pretend play, planning, and memory. *Physical and Motor Development* encompassed depictions of physical activity, dancing, and learning about sports. *Language and Literacy Skills* included learning about sign language, ways to communicate, and vocabulary. Several early literacy behaviours were included here as well: presentation or mention of the alphabet and depictions of reading. *Social-Emotional Development* focused on self-awareness, social skills, and interactions with others.

In most cases, only one domain was coded per scene according to the type of content most heavily featured in that scene. However, in cases where two content areas were featured with equal emphasis ($N = 328$ of 6971 scenes, 4.71%), two domain codes were coded. Two domains were the maximum number for any one scene. In addition, a domain classification of 'other/unclear' was coded for those scenes that were less than 2 s in total duration (as content contained in such a brief segment would presumably be presented too quickly for infants to process) or that contained content not clearly classifiable into any of the five educational domains. For example, a scene consisting mainly of a decontextualized image of a toy was not clearly classifiable as the educational intent was too ambiguous. A domain code of 'credits' was given during opening and closing credits. Credit durations were not further analysed and were not included in the overall duration calculations. Two of the programs in our sample featured substantially longer scenes than other programs. As a result, each long scene consistently contained more than two domains and, by definition, were excluded from further educational domain coding analyses.

Scenes associated with each of the five educational domains were converted into the *percentage of scenes* coded with a particular domain (i.e. the total number of scenes coded with a domain divided by the total number of scenes found in a particular DVD), as well as, the *duration of time* coded with a domain (i.e. total amount of time coded with a domain divided by the total amount of time of the DVD minus opening and closing credits for each program) (Table 2).

Claim matching between educational claims and DVD content: In a separate coding pass, coders matched each claim's set of operational definitions to specific DVD content that matched the operational definition. For example, a producer claim regarding general knowledge of color and number may have been coded with an

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operational definition of 76 'General knowledge of objects in the physical world.' The full operational definition was as follows: 'Knowledge of general properties of common objects in the world (i.e. colors, names of common objects, and parts of objects such as animals, body parts, sizes, matching, filling/emptying, in/on, etc.) and knowledge of how to use objects such as tools' (Scott Little *et al*., 2008; p. 58). The coder watched the video and coded each instance of content with the code 76 that matched the operational definition throughout the DVD, e.g. presentation of numbers would be coded as a claim match. The number of claim matches was then compared against number of overall claims for all products to derive the frequency with which matching claim content was presented. A single scene could potentially contain multiple instances of matched content to different operational definitions (Table 4). That is, this coding pass allowed very specific details of the producer claims to be matched to very specific DVD content.

Data Analysis

In addition to descriptive analyses, associations between overall number of educational claims, domain content, and content matching specific claims were calculated for each of the 58 programs. First, each claim type (i.e. explicit, implicit, and explanatory) was calculated as the proportion of total claims made for a given program under each of the five broad educational categories (e.g. Scott-Little *et al*., 2008). Second, educational domains were calculated as the proportion of scenes and the total time (minus opening and closing credits) in each program that contained a particular type of content fitting each of the five broad categories. Third, programs were analysed at the scene level ($N = 6971$ total scenes) to examine the amount of content coded as matching one or more of the educational claims made by producers of that product, and these proportions were compared with the overall numbers of claims made.

RESULTS

Reliability

Two coders independently viewed 37% of the sample and assessed the product materials. Categories were mutually exclusive and percent agreement ranged from 85% to 100%. Another two coders also independently coded 41% of the educational claims found in product materials and did the claim matching, and a final two independently coded 23% of the sample for educational domain. Reliability was calculated for behaviour claims and verbs, type of claim, educational domain coding, and operational definition. Overall reliability was $\kappa = 0.91$ for behavioural claims and verbs, $\kappa = 0.87$ for type of claim, $\kappa = 0.80$ for operational definitions, $\kappa = 0.78$ for designating a match between claim and content, and $\kappa = 0.82$ for educational domain coding.

Descriptive Statistics

Coding product materials

Target age: All programs in the sample listed a target age span beginning at or prior to 24 months of age. The earliest suggested age was '0' (14% of programs); however, most DVDs provided age ranges that began at 12 months (22%) or 6 months (19%). The most frequent age span provided was from 6 to 36 months

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(10% of programs) while the broadest suggested age span ranged from 0 to 6 years (1 program; 1.7% of sample), followed by 0–5 (6.8%), 0–4 (1.7%) and 1–5 (3.5%). Fifteen other programs (26%) listed no upper age limit.

Mode of interaction and supplementary materials: Participatory viewing by the infant (i.e. other than simply watching the video) was recommended by 65.5% of producers. A majority of videos (83%, or 48/58 products) provided some type of supplemental materials (e.g. suggestions for activities or 'tips' for parents viewing the videos with their infants). Finally, 26.8% (15/58 products) provided an option for repeat/continuous play.

Claim readability: The average claim readability for 54 of the 58 products surveyed was 13.33 (S.D. = 2.65; range 8.3–20.9). This finding suggests that, on average, the packaging was written at the reading level of a high school graduate.

Educational claims found in product materials

Overall, the packaging of the 58 DVDs in our sample implied some educational benefits of viewing: approximately 35% of the DVD titles were rated as directly implying educational benefit (i.e. high), 38% were rated as implying some educational benefit (i.e. medium/low), and 28% were rated as neutral, not implying any specific educational benefit. Over 80% of DVD product materials referenced academic research on the packaging, approximately 60% listed awards or honors, and 74% listed endorsements by various professionals or organizations.

There were 686 claims identified (per DVD $M = 11.83$; S.D. = 11.22). The number of claims for a particular product ranged between 1 and 59. Approximately one quarter of the claims (23%) were classified as general, making a vague mention of a learning goal (e.g. 'this video *inspires* learning'). Over a third of the claims (38%) were implicit with some sort of learning suggested or implied (e.g. 'this video *introduces* children to the alphabet'). Fourteen percent of claims were explicit, referring to an observable outcome associated with DVD use (e.g. 'this video *teaches* children the alphabet'). Another 24% of the claims were explanatory; that is, they were visual or verbal statements that listed DVD content without any benefit or outcome attached to that content (e.g. 'topics covered: alphabet, phonetic awareness').

Claims as a function of domain: The 511 claims classified as implicit, explicit, or explanatory were coded using five educational domains: general knowledge, social emotional, physical, cognitive, and language/literacy development (Scott-Little *et al.*, 2008). Table 1 lists explicit, implicit, and explanatory claims as a function of these broad educational domains. Overall, 31% of claims were general knowledge, 27% were language and literacy, 15% were social–emotional, 12% were physical development, 11% were cognitive, and 4% fell into other categories. Seventy-two percent of videos contained at least one general knowledge claim, 59% made at least one language-related claim, 36% made at least one physical development claim, 29% made at least one cognitive claim, and 26% made at least one social–emotional claim. There were significant differences between claim type and domain content area (χ^2 (12) = 92.53, $p < 0.001$). Language/literacy claims were most often explicit in nature, whereas general knowledge claims typically used explanatory statements. Implicit claims were fairly evenly distributed across domains (Table 1).

What are the specific curriculum elements targeted by claims?: Each claim was further coded using 78 possible operational definitions pertaining to the five educational domains. For general knowledge claims, the most frequently used operational definitions included knowledge of objects in the physical world

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Table 1. Types of claims as a function of claim category for explicit, implicit, and explanatory claims

	Social/ Emotional		Cognitive		Language/ Literacy		Physical development		General knowledge		Other		Totals
Explicit	5 (7%)[b]	(5%)[a]	7 (12%)[b]	(7%)[a]	49 (34%)[b]	(51%)[a]	4 (6%)[b]	(4%)[a]	31 (19%)[b]	(32%)[a]	1 (8%)[b]	(1%)[a]	97
Implicit	56 (76%)[b]	(22%)[a]	29 (48%)[b]	(12%)[a]	62 (43%)[b]	(25%)[a]	40 (65%)[b]	(16%)[a]	57 (36%)[b]	(23%)[a]	7 (58%)[b]	(3%)[a]	251
Explanatory statement	13 (18%)[b]	(8%)[a]	24 (40%)[b]	(15%)[a]	33 (23%)[b]	(20%)[a]	17 (27%)[b]	(10%)[a]	72 (45%)[b]	(44%)[a]	4 (33%)[b]	(2%)[a]	163
Totals	74		60		144		61		160		12		511

[a]Percentage relative to total number of implicit, explicit, or explanatory claims.
[b]Percentage relative to total number of social/emotional, cognitive, language/literacy, physical development, general knowledge, or other claims.

(34%, e.g. shapes and colors) and mathematics (33%, e.g. number, counting). For language/literacy claims, the most frequently used operational definitions were vocabulary based (36%), followed by speaking and grammar (20%). The largest category of cognitive claims included hypothesizing and prediction (26%), followed by problem solving, planning and intentionality, and exploratory play (around 10% each). For physical development claims, the most frequently used operational definitions were for physical fitness and sports (34%) or gross motor skills including dancing (31%). Finally, for socio–emotional claims, the most frequently used operational definitions were those referring to interactions with others, including social skills with peers (22%) and adults (15%), and social play with peers (21%).

Educational Video Content

General structure of videos

Of the 58 videos surveyed, the majority featured live action (22 videos; 37.9% of sample) or a mix of live action and other types of content (puppets/muppets or animation; 28 videos, 48.3% of sample). Four videos (6.9%) contained exclusively animated content, while another four videos contained exclusively puppets/muppets. Program continuity coding indicated that most were Low Magazine (81%); that is, videos consisted of a series of brief, unrelated vignettes rather than a single narrative or story. The next most prevalent type of continuity were programs containing a cohesive or thematically related group of shorter vignettes (i.e. Medium Magazine continuity; 17% of videos) while just 2% were narrative programs.

Educational domains: Distributions of program content representing the areas of general knowledge, language and literacy skills, social–emotional development, physical/motor development, and cognitive development were calculated as a function of proportion of scenes and total duration (minus opening and closing credits) for each program. Overall, DVDs were thematically organized. The most frequent type of content was general knowledge, accounting for nearly half (49.4%) of total program duration. Language and literacy content accounted for approximately 1/3 of total program duration (27%), while social–emotional and physical development content accounted for approximately 19% and 14% of total program duration, respectively. Cognitive development content was less frequently represented, accounting for only about 5% of total program duration. Interestingly, content classified as 'other' also constituted about 5% of total program duration. Moreover, one program in the sample contained a majority (72%) of this type of ambiguous content (Table 2).

Table 2. Percentage of total scenes (S.D.) and percentage of total duration (S.D.) for each of the educational domain codes

	General knowledge	Language/ Literacy	Social/ Emotional	Physical development	Cognitive	Other
% of total scenes	43% (37)	24% (36)	17% (28)	12% (27)	2% (7)	11% (14)
% of total duration	49% (39)	27% (38)	19% (31)	14% (30)	5% (4)	4% (10)

Note: By definition, every scene was coded for educational domain content; if the content was ambiguous and did not clearly fit into at least one of the five domains (general knowledge, social emotional development, physical development, cognitive development, or language/communication development), it was assigned a domain classification of 'other'. The total adds to over 100% because it was possible in some scenes for more than one domain to be coded.

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Relation of Educational Claims to DVD Program Content

Overall, positive significant associations were found between number of claims and percentage of DVD content within a given domain (Table 3). Language and literacy development claims were negatively correlated with nearly every other educational domain except language domain. A similar trend was found for general knowledge claims, reinforcing the thematic nature of the infant-directed videos and suggesting that producers of language/literacy- and general knowledge-focused videos may be presenting this material to the exclusion of other types of educational content.

Claim specificity and domain

Figure 1 depicts the percentage of scenes containing each of the five educational domains for videos making explicit, implicit/explanatory, or no claims. The majority of scenes containing general knowledge, language and literacy development, and physical development content occurred in programs that made some type of claim related to those domains. In fact, nearly all language and literacy content occurred in videos making at least one explicit, implicit, or explanatory claim while only 1% of scenes featuring language and literacy content occurred in DVDs making no language- or literacy-related claims. Implicit or explanatory claims across all educational domains predicted more scenes with corresponding domain content when compared with explicit claims. The majority of scenes containing social–emotional and cognitive development content occurred in DVDs that did not make any claims related to those domains, suggesting that this type of content, even when present, is less likely to be highlighted or promoted by the producers of infant-directed programs.

Matching educational claims to educational video content

The most frequent operational definitions matched to each educational content area were those related to sports and gross motor skills (47% and 20% of all

Table 3. Overall associations between number of claims and type of content (% time per educational domain) ($N = 56$ programs)

Type of content	Number of social–emotional claims	Number of language claims	Number of general knowledge claims	Number of cognitive claims	Number of physical/motor claims
% time social emotional domain	0.35**	−0.17	−0.13	0.22	−0.09
% time language development domain	−0.17	0.67**	−0.23	−0.20	−0.22
% time general knowledge domain	−0.21	−0.36**	0.45**	0.15	−0.16
% time cognitive development domain	0.21	−0.03	−0.04	0.56**	0.25
% time physical development domain	0.13	−0.30*	−0.21	0.01	0.59**

*$p<0.05$ **$p<0.01$. *Note*: claims were coded from product materials and educational domain was coded independent of claims. Every scene was coded for educational domain content into one the five domains (general knowledge, social emotional development, physical development, cognitive development, or language/communication development) and ambiguous content was assigned a domain classification of 'other'.

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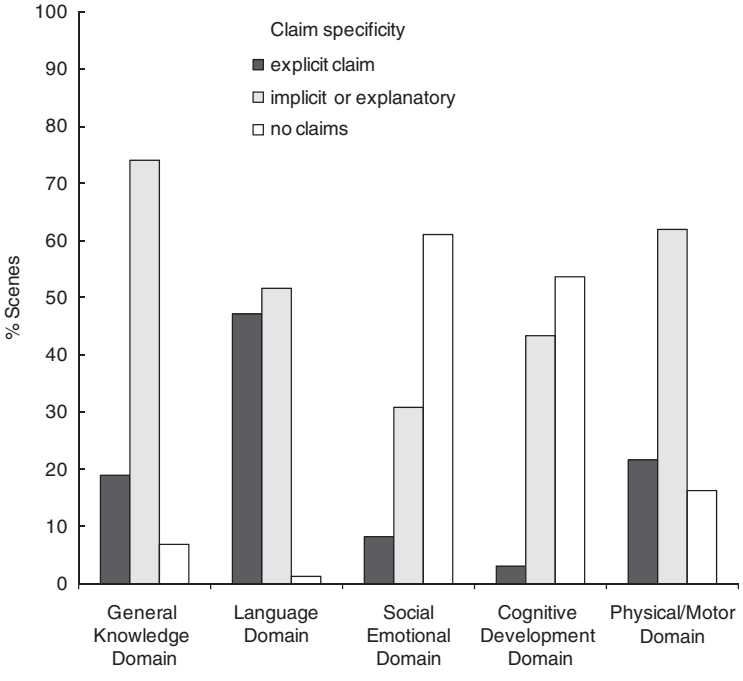

Figure 1. Distribution of claim type among scenes within each educational domain. The figure shows the percentage of scenes containing each type of educational domain content for each video ($n = 56$ videos) as a function of the highest level of specificity (explicit, implicit/explanatory, or no claim) for claims made relative to that domain for each video. Claim specificity types were mutually exclusive, with explicit claims considered to be at the highest level of specificity; thus, if a video contained both explicit and implicit/explanatory claims for a given domain, all domain-matching scenes for that video were classified as having 'at least one explicit claim related to domain'. The number of coded scenes for each educational domain were as follows: General Knowledge = 2732 scenes, Physical/Motor Development = 517 scenes, Social/Emotional = 592 scenes, Language/literacy = 2080 scenes, Cognitive = 42 scenes.

content matched to physical claims, respectively), social skills with peers and shared peer activities/social play (24% each of all content matched to social–emotional claims), vocabulary and speaking/syntax (30% and 37% of all content matched to language claims), conjecture, hypothesizing, and guessing (49% of all content matched to cognitive claims), and knowledge of objects in the physical world and music (46% and 22% of all content matched to general knowledge claims). The operational definitions were then collapsed across domain category to calculate the frequency with which specific claims matched content.

Table 4 presents the content area distributions for overall numbers of claims compared with content coded for matching specific claims. General knowledge claims were made most frequently (almost one-third of claims) and represented nearly half of all claim matched content. Language/literacy claims were next frequent, accounting for almost another one-third of the claims made and 37% of claim matched content. Physical development claims comprised 12% of all claims made and nearly 10% of claim matched content. Although social–emotional and cognitive development claims accounted for nearly 15% and 12% of claims,

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Table 4. Content area distributions for claims made and corresponding claim matched program content

Claim content	Total number of videos with at least one content claim	Total number of claims found on packaging, website, and promotional materials	Percentage of all coded claims	Total number of times content matched claim across all videos	Average number of matches per claim	Percentage of all claim-matched content
General Knowledge	42	160	32.00	2964	18.53	47.30
Language/Literacy	34	144	28.90	2292	15.92	36.57
Social–emotional	15	74	14.80	291	3.93	4.64
Physical development	21	61	12.20	585	9.44	9.33
Cognitive development	17	60	12.00	135	2.25	2.15

Note: This table denotes specific matches between specific producer claims and content.

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respectively, the number of scenes coded for content matching these claims was comparatively low.

DISCUSSION

Despite the continuing popularity of infant-directed media products, little research to date has explored exactly what type of content is presented in these videos, and, more importantly, whether this content is reflective of the many educational claims made by producers. The present research represents the first analysis of claim-matching-content in screen media designed for children aged 0–3. As such, these findings offer a much-needed exploration of the accuracy with which infant-directed media products are marketed to families. This exploration is of considerable interest given the ongoing debate regarding media exposure and very young children (Anderson & Hanson, 2010) as well as more recent controversies surrounding the potentially misleading claims made by infant videos (e.g. Lewin, 2009).

The present analyses of 58 infant-directed programs demonstrated that most producers made some sort of claim about developmental benefits associated with viewing these products. Beyond claims, even the DVD titles implied some type of educational benefit. These findings echo parental reports obtained with prior surveys of infant-directed media claims (e.g. Garrison & Christakis, 2005), suggesting that media designed for infants continue to be produced and promoted with claims of enhanced learning and the presence of content potentially consistent with those claims. The high percentage of claims made by the producers as well as the accessibility of these claims for parents (e.g. found on packaging, websites, accompanying materials, and written at a high-school level) suggests that such claims may be at least partially driving the infant DVD market. Product materials that mention educational research coupled with the frequent listing of awards and professional endorsements also enhances the appeal and perceived utility of these products as learning tools (e.g. Zimmerman *et al*., 2007b).

The majority of supplemental materials suggested that parents co-view the DVDs with their infants and toddlers. Should it turn out that such messages result in increased co-viewing, this would have the potential to have a positive impact in terms of both enhancing caregiver–child interactions and facilitating learning from these products given the demonstrated benefits of parental co-viewing (e.g. Pempek, Demers, Hanson, Kirkorian, & Anderson, in press). An additional finding related to the viewing context was that most of the products in our sample included a 'repeat play' option. On the positive side, using this option offers infants multiple opportunities to become familiar with DVD content via repetition. Repetition has the potential to rapidly extend memory networks associated with presented content, a property that may be particularly important for learning from DVD presentations (e.g. Barr, Muentener, Garcia, Fujimoto, & Chavez, 2007). On the other hand, a repeat play function may also signal to parents that they can let the DVD play repeatedly while they do other things. As a result, the developmental benefits of co-viewing are lost and the viewing context (and consequently, the learning environment) becomes less optimal (e.g. Barr, Zack, Garcia & Muentener, 2008; Cook *et al*., 1975).

The products analysed in the present study were thematically organized with a strong emphasis on single content areas such as literacy (e.g. *Your Baby Can Read*) or sports (e.g. the *Athletic Baby* series). Producer claims were used most

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frequently for language and literacy development (especially vocabulary and grammar) and general knowledge areas (e.g. number recognition, counting, shapes and colors). This finding stands in contrast to the ELGs developed by Scott-Little *et al*. (2008) that emphasized a wider range of developmentally appropriate areas, including social–emotional, physical/motor, and cognitive development, to parents of children aged 0–3 years. The frequent connections between educational claims and general knowledge and language content are not necessarily surprising given that each of these two broad domains encompass multiple sub-categories. Although young infants are able to perceive colors and letters, the development of symbolic representation allowing for learning of the alphabet and color understanding tends to develop very slowly (e.g. DeLoache, 2004). Most of the coded videos were created for infants aged 6–12 months. Because infants and toddlers have difficulty transferring information from television to the real world (i.e the video deficit; Anderson & Pempek, 2005), general knowledge claims and literacy claims linked to such developmentally advanced concepts may well be overstated, although these issues remain open empirical questions. Ongoing scene-level analyses examining co-occurrences of content matched to educational claims with developmentally appropriate teaching strategies (Vaala *et al*., this volume) and with onscreen interactions (Fenstermacher *et al*., b this volume) will shed further light on how educational content is presented in videos designed for infants.

The formats used to present the content were also of some concern. More specifically, content was frequently presented using short, unrelated vignettes rather than a single continuous narrative. In previous research, infants and toddlers demonstrated lower language scores when they spent more time viewing magazine-formatted programs (i.e. low or medium continuity) and higher language scores when they spent more time viewing narratives (Linebarger & Walker, 2005). Content classified as 'other' tended to fall into one of two types: scenes that were too rapid to be easily processed by infants (i.e. less than two seconds in total duration) and scenes that contained decontextualized material not clearly classified into any of the educational domains. Although 'other/unclear' content represented about 5% of total DVD duration, the duration range across programs varied widely (0–72%). Coupled with the high percentage of programs that were presented using a structurally inappropriate format characterized by brief unrelated magazine vignettes, this finding emphasizes a need for greater attention to the design of programs tailored to infants' information processing capacities. Given the somewhat surprising findings regarding the structure and content of these infant-directed programs, empirical investigation of the implications of both short-term and long-term exposure to infant-directed programming as a function of different structural properties and content types rather than a function of overall exposure alone should be conducted.

The majority of videos featured live-action human characters, whether exclusively or in combination with puppets/muppets or animation. Research investigating the transfer of knowledge from picture books indicates that transfer is more likely to occur when objects and items are actual photos or line drawings of the objects compared with cartoon presentations (Ganea, Bloom-Pickard, & DeLoache, 2008). These results suggest that infants will be more likely to transfer their understanding from live action content to actual three-dimensional objects and items found in infants' everyday environments (Ganea *et al*., 2008). Furthermore, infants are particularly tuned in to other people in their environments (e.g. Meltzoff, 2007; Vygotsky, 1978). They are interested in faces and 'real' characters that, when present, should result in greater attention to these

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characters, especially when these characters are actively engaged, interacting with one another, or eliciting viewer participation (for further discussion, see Fenstermacher *et al*., b, this volume).

Although the overall number of educational claims related to a given content area was positively associated with the presence of corresponding DVD content (Table 3), a more detailed breakdown of the associations between claims and content (Figure 1) indicated that all content types are not equally represented by claims. Thus, the final step of the present analysis was to investigate exactly where and how many times content matched any of the implicit or explanatory claims that were associated with that specific program using specific operational definitions of claims to match the content. At a broad level, there was at least some degree of matching between educational claims and the educational content, mainly for language/literacy and general knowledge claims. Cognitive and social–emotional development content was substantially under-represented in the DVDs (Table 4). When this kind of content did appear, it was most often found incidentally in programs that did not make any social–emotional or cognitive development claims (Figure 1). Infants and toddlers undergo rapid social–emotional growth during the first 3 years of life. The low levels of social–emotional content in general and the incongruence between social–emotional claims and content was particularly surprising. This trend may be the result of the tendency to target parents' concerns that they must provide more academically oriented content, materials, and toys to their infants early and often.

Limitations of our study include the sampling and coding systems as well as the analytical approach. We assessed the content at a fine-grained level by examining content scene-by-scene from a random sample of two DVDs per series. We elected not to analyse more than two DVDs within a specific series and, as a result, are unable to determine if some series were more consistent in depicting educational content that matched their claims than others were. In preschool programming, Singer and Singer (1998) found considerable variability across a season's worth of *Barney and Friends* episodes. This type of information would be especially useful for parents and practitioners who are buying specific products. We also conducted numerous analyses that, given the large number of analyses, may have resulted in a number of spurious relations. While this concern may be evident in most research, the purposes of this study were to develop an initial profile regarding how infant DVDs are structured and how well the claims made about these products are represented in the content. Furthermore, we coded both overall domain content per scene and specific point by point matches between claims and content. This approach, which takes both a broader and narrower system, reduces the possibility that we either underestimated or overestimated the connection between claims and content. Finally, we know very little about what kind of an educational curriculum delivered via DVDs makes sense for young infants. As a first step, the codes we developed were heavily based on existing literature regarding the formats and features that improve learning in face-to-face interactions. In addition to research evidence, we also used infant–toddler early learning standards adopted by a number of states around the US.

In conclusion, the educational marketing claims made about infant-directed media indicate some awareness of early child development milestones. The uneven representation of educational content, the relatively low correspondence between educational claims and educational content, and the tendency to select content that may be beyond the cognitive abilities of very young children indicates problems in translating educational claims to age-appropriate content (see also Goodrich *et al*., 2009). Infants' immature cognitive capacities require that

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any content must be presented in ways that support learning. Outside of a screen media context, infants learn best through engaging interactions with more competent others, simple and linear narratives, and repetitive presentation of content. Given the already precarious nature of very young infants' abilities to learn from a 2D screen (e.g. the video deficit effect; Anderson & Pempek, 2005), as well as the potential for adverse impacts of media, such as reduced parent–child interaction during media exposure (e.g. Christakis, 2009; Kirkorian, Pempek, Schmidt, & Anderson, 2009), the manner in which educational content is conveyed through infant-directed DVDs is important and requires further and substantial empirical attention.

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