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Gender Stereotypes in Educational Software for Young Children

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Children are increasingly being exposed to educational technology at school. In response to this, the International Society for Technology in Education (ISTE) drafted a set of technology standards for teachers (ISTE, 2002) that specifically states that teachers should empower all students and support diversity. This content analysis of educational software for preschoolers was designed to look at gender representations and stereotyping. The results demonstrated significantly more male characters than female characters in preschool educational software, which makes it difficult for teachers to address gender diversity and suggests that girls are not as valued as boys are. Male characters were also more likely than female characters to exhibit several masculine-stereotypical traits. In addition, female characters more than male characters exhibited counterstereotypical behaviors, yet were more gender stereotyped in appearance.

KEY WORDS: gender stereotypes; educational software; preschoolers; gender bias.

The increasing use of computer technology in schools and households is exposing children to a wide variety of new media resources. Public debate over the effects of computers has most often concerned children's exposure to violent and sexually explicit material in computer games and on the Internet. Less national attention has been paid to other potentially detrimental effects, such as the perpetuation of social biases and stereotyping, and to other forms of technology, such as educational software. Educational software tends to be viewed as more wholesome, "family-oriented," and scholastic than other forms of computer software and is therefore generally ignored as a potential source of negative influence on children. Little systematic research has been conducted on biases and stereotypes found in educational software, despite its widespread use. Therefore, the current study was designed to investigate one form of stereotyping that may occur in this educational medium—gender stereotyping.

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THE ROLE OF GENDER STEREOTYPES

Feminist scholars (e.g., Kilbourne, 1999; Ruscher, 2001; Tavris, 1992) have asserted that feminine and masculine gender role stereotypes are constraining and therefore limit individuals' potential. Pervasive negative stereotyping in a culture serves to normalize biased portrayals of individuals, thereby preserving the status quo (French, 1992; Ruscher, 2001). In addition, researchers in the field of cognitive psychology have shown that to simplify and conserve mental resources, individuals tend to develop stereotypes, which are then used for filtering, organizing, and remembering information (Macrae, Milne, & Bodenhausen, 1994; Sherman & Frost, 2000). Such stereotypes, as simplified and generalized constructs of complex phenomena, can then affect, often negatively, individuals' attitudes and performance (Aronson, Quinn, & Spencer, 1998; Stangor, Carr, & Kiang, 1998).

STEREOTYPING IN THE MEDIA

One powerful source of stereotyping in societies is the media to which individuals are exposed.

Messages concerning stereotyped gender roles are relayed to individuals of all ages and from a multitude of media sources. Research has shown the existence of highly stereotyped gender roles in television aimed at both children and adults (Elasmar, Hasegawa, & Brain, 1999; Huntemann & Morgan, 2001; Signorielli, 2001; Thompson & Zerbinos, 1997), magazines (Vigorito & Curry, 1998; Willemsen, 1998), children's books (Gooden & Gooden, 2001; Oskamp, Kaufman, & Wolterbeek, 1996), comics (Brabant & Mooney, 1997), advertisements (Bartsch, Burnett, Diller, & Rankin-Williams, 2000; Furnham & Mak, 1999), and video games (Dietz, 1998; Subrahmanyam, Kraut, Greenfield, & Gross, 2001).

In the field of education, researchers have provided evidence that gender stereotyping is present in various forms of educational media, such as textbooks (Hogben & Waterman, 1997; Peterson & Kroner, 1992), preschool picture books (Oskamp et al., 1996; Tepper & Cassidy, 1999), award-winning children's literature (Dougherty & Engel, 1987), and educational television (Barner, 1999). Research has also informed teachers and administrators about the ways in which gender stereotyping and biases can negatively impact students and about the importance of inclusion and diversity in education curricula and classroom climate (Mueleners, 2001; Sapon-Shevin, 1996).

The educational media that have taken on an increasingly important role in the past years have been technology-based media, especially in the form of the Internet and educational software. In 1993, with funding from the United States Department of Education, the International Society for Technology in Education (ISTE) drafted its first set of technology standards for teachers (ISTE, 2002). These standards, currently in the third edition, have become known as the National Educational Technology Standards for Teachers, which are used by accredited education programs for preschool through 12th grade teachers. Specifically listed in these national standards are statements that the teacher should (a) "apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities" and (b) "identify and use technology resources that affirm diversity" (ISTE, 2002, p. 9). These standards may in part be an attempt to address the large "technology gap" that exists between the genders (American Association of University Women Educational Foundation, 1998, 2000). Thus, educators have been alerted to the fact that gender stereotyping and biases may have a causal effect on the creation of the technological gender gap.

Research concerning gender stereotyping in computer-based educational resources has been surprisingly lacking, despite the increased use of technology in schools, the ISTE standards that address the importance of affirming diversity with technology, and the large body of literature that shows the negative effects of stereotyping (e.g., Blair & Sanford, 1999; Brown, Steele, & Walsh-Childers, 2002; Signorielli, 2001). Chappell's study (Chappell, 1996) of 17 mathematics educational software packages, Milburn, Carney, and Ramirez's research (Milburn, Carney, & Ramirez, 2001) concerning computer clipart, and Drees and Phye's study of 34 language arts software packages (Drees & Phye, 2001) are the only known content analyses of gender biases in software used in educational settings. All three studies showed that images of girls and women and female characters were portrayed substantially less often than images of boys and men and male characters; however, the studies differed in their findings regarding gender stereotyping.

Chappell's study (Chappell, 1996) of educational software for preschoolers through 12th-graders did not include ratings of characters' gender-stereotyped behaviors and traits; however, the researcher assessed the degree to which activities in the software were based on two masculine stereotyped actions—violence and competition. Chapell found that the degree of competition and violence increased with software grade level. Preschool software ($n = 3$) was virtually free of violence and contained no competition; thus, it was the least masculine gender role stereotyped.

The other studies concerned the extent to which the characters in software exhibit gender stereotyped behaviors and traits. Milburn et al.'s research (Milburn et al., 2001)revealed that clipart presented human characters in highly gender-stereotyped ways. Female characters were more often passive, nurturant, and engaged in feminine stereotyped activities (e.g., setting the table), whereas male characters were more often active, non-nurturant, and engaged in masculine stereotyped activities (e.g., sawing wood). Drees and Phye (2001), however, found no statistically significant ($p < .05$) differences between male and female characters in terms of gender role stereotyping. They coded children's language arts software using the list of 21 gender-stereotyped traits (e.g., directive, passive, nurturant, competitive) that

Oskamp et al. (1996) utilized in their study of preschool picture books. Drees and Phye speculated that their results differed from Oskamp et al.'s partly because of the use of different statistical analyses in the two studies and partly because of an improvement over the past several years in media portrayals of male and female characters.

Based on Gooden and Gooden's recommendation that more content analyses should be performed on preschool educational materials (Gooden & Gooden, 2001), the topic under investigation in the current study is the degree to which gender role stereotyping exists in educational software for preschoolers. Software specifically targeted at young children has been found to contain very little gender role stereotyping (Chappell, 1996; Drees & Phye, 2001) even though other media aimed at this age group have been found to be highly gender stereotyped (Barner, 1999; Dougherty & Engel, 1987; Oskamp et al., 1996; Tepper & Cassidy, 1999). In the current study, analyses were performed on a greater number of software packages and a broader range of topic areas than those used by Chappell (1996) and by Drees and Phye (2001) in order to increase the generalizability of the results. In addition, a comprehensive coding scheme was developed in accordance with those used by others, so that the current findings could be compared to those of previous studies.

METHOD

Sample

I selected software packages from the list of most highly rated educational software for young children (ages 3 to 6 years) on the DiscoverySchool.com web site (http://school.discovery.com/parents/reviewcorner/software/ages.html#three), a site that uses education professionals and parents to assess the educational value of software. I used DiscoverySchool.com as the source of educational software reviews for several reasons. First, reviews are made with the input of professionals, parents, and children, thereby employing multiple perspectives in the assessment of the software. Second, the site is a free source of software reviews and is therefore accessible to a wide variety of individuals. Third, the web site states: "When selecting outstanding educational software programs, we look for products that are thoughtfully designed and produced and that appeal to a child's humanitarian qualities—ones that offer positive, encouraging, and socially responsible experiences to the children who use them." Therefore, DiscoverySchool.com's web site provided a list of highly rated, well-respected software titles. One hundred and three software packages for 3–6 years old children were listed on the web site when it was accessed December 27, 2002.

If more than one software package involved the same main animated characters or if several packages were part of a series, then only one of the packages was used for data analyses. If a software series involved the same content area and differed mainly in the age of its target audience (i.e., toddler, preschooler, kindergartner), the software aimed at preschoolers was chosen for analysis. Some software packages (e.g., *Buddy Brush and the Painted Circus*, *Buddy Brush and the Painted Playhouse*) differed mainly in the settings in which the same main characters interacted; therefore, in these cases one software package was chosen randomly to use for analyses, to reduce the chance of redundancy in coding. Foreign language learning software and software packages costing over $45 were not included in data analyses, because these software packages likely appealed to a smaller and more selective audience. Four titles (i.e., *Adiboo Discover Nature, Animals & Planets*, *Barney on Location All Around Town*, *Noddy Playtime in Toyland*, *Rainbow Hoppers*) were not included in analyses because they could not be found, even after an extensive Internet search. The total number of software packages used for data analyses in the current study was 48 (see Appendix).

Procedure

Each software package was analyzed for gender stereotyping using a coding scheme developed in accordance with those used in previous research. If the software package contained more than one CD, only the first CD in the series was used for analysis. Coders first counted the number of male, female, and nongendered characters. Characters were human, human-like (e.g., puppets, monsters, aliens), animal, or mechanical (e. g., cars, robots). Coders assessed gender through the software's use of gendered names and pronouns. Each character was counted only once. Whether the characters were main or secondary characters was also recorded. Main characters were those who appeared in the majority of scenes and whose names were often included in the titles. Secondary characters consisted of talking

characters who appeared more than twice in the software, but not as often as the main characters.

Following others' procedures (Oskamp et al., 1996; Thompson & Zerbinos, 1995), each male and female character was rated on the degree to which he or she was gender role stereotyped. After reviewing the software package, coders used a 5-point scale to give separate global ratings for each character's (a) appearance (e. g., clothing, hair styles, accessories) and (b) behavior in terms of gender role stereotyping. These ratings required the coders to give their overall impressions of the main and secondary characters after viewing the entire software program, rather than after merely time sampling a small, possibly unrepresentative, segment of the program. Most children eventually explore an educational software package in its entirety; therefore, they will likely gain an overall impression of each character based on the cumulative images and behaviors presented.

The rating scale ranged from *very counterstereotyped* (1) to *very gender stereotyped* (5). A rating of 3 meant that the character was neither consistently stereotyped nor consistently counterstereotyped. Although others (Drees & Phye, 2001; Oskamp et al., 1996; Thompson & Zerbinos, 1995) did not give separate ratings for appearance and behavior, the inclusion of such a differentiation was expected to yield more accurate and informative data concerning gender role stereotyping.

To understand more fully the kinds of gender role stereotypes that may be exhibited in educational software, researchers also rated each female and male character on 19 different gender stereotyped traits and behaviors. Again, ratings were based on overall impressions of each character after coders viewed the entire software program. The list of characteristics was developed based on the coding schemes used by Barner (1999), Oskamp et al. (1996), and Thompson and Zerbinos (1995). The eight feminine stereotyped traits were dependent, cooperative, passive, victimized by aggression, nurturant/shows affection, emotional, rescued by others, and asks for advice/help. The 11 masculine stereotyped traits were independent, competitive, risk taking, active, aggressive, rescues others, gives advice/help, explorative, athletic, and persistent. Coding of the characteristic "asks for advice/help" was further differentiated into whether the characters' behaviors were directed toward other characters in the software or were directed toward the child playing the game. Therefore, characters were rated on a total of 20 traits and behaviors. To rate the degree to which characters exhibited the traits and behaviors, coders used a 3-point scale, with 1 meaning *not at all*, 2 meaning *somewhat*, and 3 meaning *very much*. Although others (Drees & Phye, 2001; Oskamp et al., 1996) coded behaviors and traits for only a main character and main character of the other sex, in this study the coders rated all main and secondary gendered characters who appeared in the software package. In addition, previous researchers (Drees & Phye, 2001; Oskamp et al., 1996) have used dichotomous rating scales to code characters' traits, whereas in this study the coders used a 3-point rating scale to increase the discriminative ability of the coding.

Coding

The researcher and two female undergraduate research assistants independently coded the 48 software packages. During the training session, coders learned the coding protocol, practiced coding software, discussed contradictory ratings, and fine-tuned the coding scheme to resolve discrepancies. One software package (*Alphabet*) contained no male or female characters or images of any sort, so it could not be included in analyses.

Of the 44 software packages that contained at least one animated main character, one package (*Piggy's Birthday Present*) consisted of only nongendered characters, whereas the 43 other packages contained one or more gendered characters. This latter data set, the one used to investigate gender stereotyping, was labeled "Gendered Character Software." Interrater reliability (Cohen's kappa) for the 44 packages was established for each pair of raters using three randomly selected software packages per pair. After the initial training period interrater reliability exceeded .80 for each of the 20 stereotyped traits and behaviors and exceeded .85 for all other items. Disagreements were resolved through discussion. Halfway through the coding, interrater reliability was again assessed for each pair of raters using three randomly selected packages that had not previously been used to establish reliability. Interrater reliabilities for frequency counts and for ratings of overall stereotyped appearance and behavior were above .80, but agreement for four stereotyped traits and behaviors (i.e., dependent, passive, gives advice/help, active) ranged from .65 to .73. Cohen's kappas for the other 16 traits and behaviors were all greater than .79.

Three software packages (*I Spy Junior*, *Kid Pix Deluxe 3*, *Phonics Mastery Level A*) included no main or secondary animated characters. Instead, the programs included a collection of images; therefore, this data set was labeled "Image Software." For these programs the coders counted the number of images of men/boys and women/girls and then rated them on how gender stereotyped in appearance they were. Cohen's kappa exceeded .85 for gender coding and .80 for gender stereotyped appearance ratings.

RESULTS

Analyses differed for the Gendered Character Software and for the Image Software because of the different nature of the data and different sample sizes. For the Gendered Character Software, analyses investigated overall gender effects while simultaneously taking into account the effect of software package. For the Image Software, the small software package sample size required that analyses be performed separately for each package.

Gendered Character Software

Visibility of Male and Female Characters

In order to analyze patterns in categorical variables, Wilcoxon signed ranks tests (Siegel & Castellan, 1988) were used to analyze data from the 43 software packages with gendered characters. In this way, the proportion of female (and male) characters in each software package could be assessed and compared to a hypothetical .50 proportion, a criterion consistent with the gender distribution in society. These proportions were compared across software packages in order to take into account the effect of the package. The non-normal distribution of proportions requires nonparametric analyses.

For main characters, Wilcoxon signed ranks tests demonstrated that the software programs were significantly more likely to contain male characters than female characters, $z = -3.58, p < .0001$. In fact, 20 packages presented only male main characters, and 18 packages included both male and female main characters. Very few ($n = 5$) of the 43 packages contained only female main characters. In contrast, analyses concerning secondary characters demonstrated no significant gender difference in visibility, $z = -.76, p = .45$. Table I presents the total number of male, female, and nongendered main and secondary characters in the 44 software packages that contain animated characters rather than stationary images.

Table I. Frequencies of Main and Secondary Characters of Different Genders

	Male	Female	Nongendered
Main characters	73	35	3
Secondary characters	183	147	17

Overall Gender Role Stereotyped Appearance and Behavior

Because data were nested within the 43 software packages with gendered characters, generalized linear models with repeated measures assessed gender differences in the continuous variables by controlling for the effect of software package. Data were analyzed using the generalized estimating equations (GEE) method (Diggle, Heagerty, Liang, & Zeger, 2002), which takes into account the clustered data from each software package. For the GEE method, score tests demonstrate whether there are significant differences on the outcome variables (Diggle et al., 2002). To investigate whether, in general, educational software for preschoolers presents characters in gender stereotyped ways, the 43 different packages that contain gendered main and secondary characters were analyzed using two separate generalized linear models with repeated measures. One model used gender role stereotyped behavior as the outcome measure, and the other model used gender role stereotyped appearance. Score test results showed no significant difference between female and male characters in terms of gender role stereotyped behavior, $\chi^2(1, N = 43) = 0.00, p = .99$. However, a difference (trend level) was found between female and male characters in the degree to which their appearance was gender role stereotyped. Female characters were slightly more gender role stereotyped in appearance than were male characters, $\chi^2(1, N = 43) = 3.24$, $p < .07$.

In order to show how stereotyped the male and female characters generally are within each software package, Table II presents, separately for each package, the mean ratings of the male and female characters' appearance and behavior (as well as the number of male, female, and non-gendered characters).

Table II. Mean Ratings for Appearance and Behavior of Male and Female Characters in Each Software Package

	Male			Female			Nongendered
	n	M_{app}	M_{beh}	*n*	M_{app}	M_{beh}	*n*
Alphabet Express	16	3.9	3.6	9	4.3	3.3	0
Arthur's Preschool	16	3.1	3.0	16	4.1	3.0	1
Away We Go!	3	3.5	3.0	0	—	—	0
Bears	3	3.0	3.0	3	3.0	3.0	0
Bear in the Big Blue House	4	2.5	3.5	1	3.0	3.0	0
Big Thinkers! Kindergarten	1	3.0	3.0	1	3.0	3.0	0
Blue's 123 Time Activities	2	3.0	3.0	3	3.0	3.0	10
Clifford	6	3.3	3.0	6	4.7	3.0	0
Cyber Grannies	0	—	—	25	3.4	3.1	0
D.W. The Picky Eater	3	4.0	3.7	6	4.2	3.3	0
Disney's Mickey Mouse	9	4.7	4.4	2	5.0	4.5	0
Disney's Winnie the Pooh	7	3.0	2.9	0	—	—	0
Dr. Seuss Preschool	10	3.5	3.2	5	3.4	3.2	0
Elmo's Reading	7	3.3	3.4	1	4.0	2.0	0
Fisher Price Ranger Trail	4	5.0	3.8	2	5.0	3.5	0
Franklin the Turtle	6	3.0	3.0	6	3.2	2.8	0
Freddi Fish 4	19	3.4	3.2	5	3.6	3.6	0
Huggly's Sleepover	3	3.7	2.7	4	3.8	3.3	0
Human Body Explorer	1	4.0	3.0	0	—	—	0
ImaginAction	1	5.0	3.0	0	—	—	0
JumpStart Music	5	4.8	4.2	2	4.5	3.0	0
Jumpstart Preschool	2	4.0	3.0	4	4.0	3.3	0
Land Before Time	4	3.0	3.3	1	3.0	3.0	1
Lego My Style Preschool	4	3.3	4.3	3	3.3	4.3	0
Let's Go Read	3	3.0	3.0	3	4.3	4.0	0
Little Bear Kindergarten	4	3.5	3.5	4	3.8	4.3	0
Magic School Bus	2	3.5	2.5	5	3.6	2.6	0
Maisy's Playhouse	3	3.7	3.3	2	4.0	4.0	0
Mia	11	3.3	3.0	3	3.7	3.0	0
Millie Meter's Nutrition	5	3.2	3.0	3	4.7	3.3	0
Ollo in the Sunny Valley	7	3.6	3.0	5	3.6	3.2	0
Oscar the Balloonist	7	3.3	3.1	5	3.0	3.8	1
Oz: The Magical Adventure	7	3.6	3.6	6	4.0	3.3	0
Pajama Sam 3	24	4.0	3.6	10	4.8	4.2	0
Piggy's Birthday Present	0	—	—	0	—	—	4
Putt-Putt Saves the Zoo	9	3.2	3.1	8	3.1	3.3	0
Reader Rabbit Kindergarten	8	3.6	3.5	6	3.2	2.8	0
Reader Rabbit Phonics	13	4.3	3.4	8	4.4	3.0	1
Reading Blaster	2	3.5	3.0	0	—	—	1
The Reading Lesson	1	4.0	3.0	0	—	—	0
Stanley Tiger Tales	5	4.0	4.2	2	4.5	4.0	0
Stuart Little	1	4.0	3.0	1	5.0	4.0	0
Wimzie's House	3	5.0	3.7	4	4.3	4.3	1
Zoboomafoo	3	3.7	3.0	0	—	—	0

Counterstereotyped Portrayals of Characters' Appearance and Behavior

In order to discover whether there are gender differences in counterstereotypical portrayals of characters' appearance and behavior, two separate design-based Pearson chi-square statistics were computed using the data from the 43 software packages that contain gendered characters. The analyses were conducted using a design-based survey analysis technique as implemented in Stata version 6.0 (Stata Corporation, 1999). This technique takes into account the design effects caused by the nonindependence of characters in the same software package. The test is based on the Pearson chi-square statistic for two-way tables but adjusts for effects of the survey design. The

analyses are reported as an F statistic. The design-based analyses were used to compare the proportions of male and female counterstereotyped and noncounterstereotyped characters, while controlling for software package.

Characters coded as 1 or 2 on the 5-point rating scale were categorized as counterstereotyped, and characters coded as 3, 4, or 5 on the rating scale were categorized as noncounterstereotyped. No significant gender difference was found for appearance, $F(1, 42) = 1.61, p = .21$. However, there was a trend level gender difference for counterstereotyped behavior, $F(1, 42) = 3.55, p < .07$. A slightly larger proportion of female characters ($n = 23/182$) than male characters ($n = 18/258$) exhibited counterstereotyped behavior, even when variations due to software package were taken into account.

Gender Role Stereotyped Traits and Behaviors

To investigate whether male and female characters in preschool software differ in the degree to which they exhibit 20 different gender stereotyped traits and behaviors, 20 separate generalized linear models with repeated measures were computed using the Gendered Character Software data set. As explained previously, the GEE method controlled for the effect of software package when the female and male characters' ratings were compared. Score tests showed that male characters were significantly more likely than female characters to be portrayed as athletic, $\chi^2(1, N = 43) = 5.05, p < .03$, and aggressive, $\chi^2(1, N = 43) = 5.56, p < .02$. In addition, a trend was found that male characters were slightly more likely than female characters to be portrayed as rescuers, $\chi^2(1, N = 43) = 3.61, p < .06$, and as risk-taking, $\chi^2(1, N = 43) = 3.23, p < .07$.

Image Software

Visibility of Images of Boys/Men and Girls/Women

For the three software packages that contain images rather than main or secondary animated characters, separate binomial tests assessed the proportion of images of boys/men and girls/women in each package. For *I Spy Junior* no gender difference in visibility occurred (.50, $p = 1.00$). However, there was a significantly greater proportion of images of boys and men in both *Phonics Mastery Level A* (.64, $p < .0001$) and *Kid Pix Deluxe 3* (.57, $p < .01$).

Overall Gender Role Stereotyped Appearance

For each of the three software packages, separate independent-samples t-tests were computed to discover if the images of boys/men and girls/women differed in how gender stereotyped their appearance was. No significant gender difference was found for the *Phonics Mastery Level A* software package, $t(116.96) = -.357, p = .72$. However, in the *Kid Pix Deluxe 3* software, images of girls and women ($M = 4.23, SD = .75$) were more gender stereotyped in appearance than were images of boys and men ($M = 3.78, SD = .73$), $t(296.62) = -5.46, p < .0001$. Images of girls and women ($M = 4.07, SD = .92$) were also more stereotyped in appearance than were images of boys and men ($M = 3.46, SD = .52$) in the *I Spy Junior* software package, $t(20.83) = -2.15, p < .05$.

DISCUSSION

Visibility

The findings of this study demonstrate that there are significantly more male main characters than female main characters in highly rated educational software for preschoolers. These results are in accordance with several other studies of children's media (Drees & Phye, 2001; Gailey, 1993; Gooden & Gooden, 2001; Oskamp et al., 1996; Thompson & Zerbinos, 1995). It is interesting that there was no gender difference in visibility for secondary characters. This finding may reflect software designers' attempt to compensate for the highly inequitable visibility of female and male main characters.

Although it is heartening that many software packages had both male and female main characters, it is also important to note that just as many programs contained only male main characters. The lower number of female main characters in computer software likely results in girls identifying less than boys do with software protagonists. As De Jean, Upitis, Koch, and Young (1999) discovered, girls are strongly engaged in software with female main characters and feel more comfortable using such software. By limiting girls' options for female characters with whom to identify, software developers not only keep girls from feeling comfortable and engaged in computer use, but also make it difficult for teachers concerned about meeting ISTE standards to "enable

and empower learners with diverse backgrounds, characteristics, and abilities" (ISTE, 2002, p. 9).

Nongendered main or secondary characters appeared in eight of the software packages and represented only 4% ($n = 20$) of the characters across all 44 software packages. In one software package (*Piggy's Birthday Present*) all the main and secondary characters were gender neutral. Although some (e.g., McNair, Kirova-Petrova, & Bhargava, 2001) have suggested that the inclusion of nongendered characters may be beneficial for eradicating gender bias, previous research has indicated that children, especially boys, assign a male label to ambiguously gendered characters (Bradshaw, Clegg, & Trayhurn, 1995; Lambdin, Greer, Jibotian, Rice, & Hamilton, 2003) thereby preserving "male as normative." Rather than creating nongendered characters, software developers can better address gender stereotyping and bias by including an equal number of male and female characters in both main and secondary roles. However, it is crucial that the behavior and appearance of such characters are not constrained by their gender.

Gender Role Stereotyping

Female characters were more gender stereotyped in appearance than were male characters, despite the finding that female characters were more likely than male characters to engage in counterstereotyped behaviors. Feminist research (Cahn, 1994; Nelson, 1994) has shown that women and girls who engage in masculine stereotyped behaviors (e.g., female athletes) often wear feminine clothing, hair styles, and adornments. Societal pressures likely propel girls and women to compensate for behaviors that are perceived as being too masculine by making certain that their appearance is clearly (and perhaps excessively) feminine. These social influences are also evidenced by the female characters in preschool educational software. The dual messages given to girls who are exposed to such software portrayals are confusing at best and destructive at worst. Girls learn that no matter what their behaviors, they should appear "appropriately feminine." Others (Douglas, 1995; Martz, Handley, & Eisler, 1995; Nolen-Hoeksema, 1990) have suggested that such a focus by girls (and women) on a stereotypically feminine appearance is associated with disordered eating, depression, and low self-esteem.

Four masculine stereotyped characteristics (athletic, aggressive, rescuing, risk taking) were exhibited more by male characters than by female characters, which is partially in accordance with others' findings (Oskamp et al., 1996; Thompson & Zerbinos, 1995). These results support the supposition that male and female characters are portrayed differently in educational software and that characteristics stereotyped as masculine are more likely to be displayed by male characters than by female characters. It is interesting that the reverse was not true: Characteristics stereotyped as feminine were not more likely to be exhibited by female characters.

In accordance with research by others (Drees & Phye, 2001; Milburn et al., 2001), the results showed that when counterstereotyped behaviors were observed, they were more likely to be observed in female characters than in male characters. These findings are not surprising, in that they reflect the larger society's greater acceptance of counterstereotyped behaviors in women and girls than in men and boys. However, this pattern sends destructive messages to girls by making it clear that stereotypically masculine behaviors are more desirable for all individuals in society. Such unequal valuing of gender-related behaviors also sends messages to boys—messages that may contribute to negative attitudes toward stereotypically feminine characteristics (and, subsequently, women and girls) and that may constrict boys' own repertoire of behaviors. As feminist theorists and researchers have suggested, media contribute to the social and power constraints based on gender (Dines & Humez, 1995; French, 1992), and sexism is communicated in various forms in order to create and maintain its status as a primary belief system in the culture (Rakow & Wackwitz, 1998; Ruscher, 2001).

Limitations and Future Directions

In this study, if more than one software package involved the same set of characters, then only one of the packages was randomly chosen to include in the analyses. This was done in order to try to reduce redundancy in coding. However, this method of sampling could have been problematic in that different software programs may represent the characters in qualitatively different ways. Therefore, to get a full (and perhaps more accurate) picture of how educational software packages portray characters of different genders, researchers may want to code all packages, even if they contain the same characters.

Educational software may differ substantially from other forms of software for children (Drees & Phye, 2001); therefore, future researchers should include a larger variety of computer packages rather than limiting analyses to top-rated educational software. In addition, previous research (Chappell, 1996) has shown that software aimed at older children contains more aggressive, competitive themes and behaviors than software for preschoolers; thus, systematic research concerning gender stereotyping in software for older children is also needed.

Content analyses provide one manner of understanding how media representations may relate to gender role stereotyping, sexism, and gender identity development, yet experimental and longitudinal studies are also needed in order to ascertain more thoroughly causal relationships and long-term effects. However, if researchers and educators are serious about addressing the technology gender gap, then it is in the best interest of female students that potential causal factors are eradicated whenever possible. Biased and stereotyped portrayals of male and female characters in computer software are such potential factors.

CONCLUSION

Overall, it is clear from the current study and from recent research that gender role stereotyping in the media, including educational media, is strong and ever present (Kilbourne, 1999; Signorielli, 2001). The key issue, of course, is whether such stereotyped media portrayals affect the attitudes of those who see and hear them. According to cultivation theory (Gerbner, Gross, Morgan, & Signorielli, 1994), the more time individuals spend involved with the media, the more likely it is that their views will be consistent with those media messages. Social cognitive theory (Bandura, 1986), too, predicts that individuals learn through observation and then use those observations to form expectations, assumptions, and behaviors. Empirical research (e.g., Blair & Sanford, 1999; Brown, Steele, & Walsh-Childers, 2002; Herrett-Skjellum & Allen, 1996) has provided support for both cultivation theory and social cognitive theory. Media portrayals can and often do affect the conceptions of femininity and masculinity that play a role in individuals' attitudes toward others and in their own identity development (Huntemann & Morgan, 2001). Thus, these media messages are far from innocuous.

In terms of educational technology, as stated by Canada and Brusca (1991), gender stereotyping and stereotypic themes must be eliminated from computer software in order to help to close the gendered digital divide. As others have asserted, the nonegalitarian status quo will continue to be preserved when gender stereotyping permeates the media (Lemish, Liebes, & Seidman, 2001; Rakow & Wackwitz, 1998; Ruscher, 2001). The current study demonstrates that beginning as early as the preschool years, educational software, even software rated highly by professionals, contains gender role stereotyping and inequitable visibility of the two genders. Therefore, despite the ISTE standards concerning the importance of affirming diversity through the use of educational technology, the software resources available for teachers and parents often run counter to those standards. These findings are even more troubling in that parents are generally ignorant of the content of software (Subrahmanyam et al., 2001) and teachers are rarely taught how to evaluate educational software thoroughly and objectively (Caftori & Paprzycki, 1997).

APPENDIX

1) *Alphabet* (NHK Educational)
2) *Alphabet Express* (School Zone Interactive)
3) *Arthur's Preschool* (The Learning Company)
4) *Away We Go! Home Version* (Scientific Learning)
5) *Bears* (PixelPark)
6) *Bear in the Big Blue House: Bear's Imagine That! (part of Preschool Pack)* (Knowledge Adventure)
7) *Big Thinkers! Kindergarten (part of World of Fun & Learning: Kindergarten)* (Humongous Entertainment)
8) *Blue's 123 Time Activities* (Humongous Entertainment)
9) *Clifford Thinking Adventures* (Scholastic)
10) *Cyber Grannies* (Kutoka Interactive)
11) *D.W. The Picky Eater* (Broderbund/The Learning Company)
12) *Disney's Mickey Mouse Preschool* (Disney Interactive)
13) *Disney's Winnie the Pooh Preschool Plus* (Disney Interactive)
14) *Dr. Seuss Preschool* (Broderbund)
15) *Elmo's Reading: Preschool & Kindergarten* (Creative Wonders/The Learning Company)

16) *Fisher Price Outdoor Adventures Ranger Trail* (The Learning Company)
17) *Franklin the Turtle: Goes to School* (Knowledge Adventure)
18) *Freddi Fish 4: The Case of the Hogfish Rustlers of Briny Gulch* (Humongous Entertainment)
19) *Huggly's Sleepover: Thinking Adventures* (Scholastic)
20) *Human Body Explorer Deluxe* (DK Interactive)
21) *I Spy Junior (part of Preschool Pack)* (Scholastic)
22) *ImaginAction* (Rose Studios)
23) *JumpStart Music* (Knowledge Adventure)
24) *Jumpstart Preschool (part of Preschool Pack)* (Knowledge Adventure)
25) *Kid Pix Deluxe 3* (The Learning Company)
26) *Land Before Time Animated Preschool Adventure* (Sound Source Interactive)
27) *Lego My Style Preschool* (Lego Media)
28) *Let's Go Read: An Island Adventure* (Edmark/Riverdeep)
29) *Little Bear Kindergarten Thinking Adventures* (The Learning Company)
30) *Magic School Bus Discovers Flight - Activity Center* (Scholastic)
31) *Maisy's Playhouse* (Sound Source Interactive)
32) *Mia: The Search for Grandma's Remedy* (Kutoka Interactive)
33) *Millie Meter's Nutrition Adventure* (Tivola Electronic)
34) *Ollo in the Sunny Valley Fair* (Plaid Banana Entertainment)
35) *Oscar the Balloonist Drops into the Countryside* (Tivola Electronic)
36) *Oz: The Magical Adventure* (DK Interactive)
37) *Pajama Sam 3: You Are What You Eat From Your Head to Your Feet* (Humongous Entertainment)
38) *Phonics Mastery Level A* (Gamco Educational)
39) *Piggy's Birthday Present*(Learning in Motion)
40) *Putt-Putt Saves the Zoo (part of World of Fun & Learning: Kindergarten)* (Humongous Entertainment)
41) *Reader Rabbit Kindergarten: Bounce Down in Balloon Town!* (The Learning Company)
42) *Reader Rabbit Learn to Read with Phonics* (The Learning Company)
43) *Reading Blaster for Kindergarten* (Davidson)
44) *The Reading Lesson* (Mount Castle Company)
45) *Stanley Tiger Tales (Playhouse Disney)* (Disney Interactive)
46) *Stuart Little: His Adventures in Numberland* (SuperMentor)
47) *Wimzie's House: Play Along with Wimzie* (Simon & Schuster Interactive)
48) *Zoboomafoo Animal Alphabet* (The Learning Company)

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