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Young Children's TV Show Preferences and Perceptions of Women in STEM

Lauren Berck

Bellarmine University

Advisor: Dr. Christy Wolfe

Reader: Dr. Ann Jirkovsky

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Abstract

Women are joining STEM fields at higher rates, yet the stereotype of math and science being for men is still reinforced to children by their parents, their teachers, and especially what they watch. Children tend to trust characters of their same gender and are more likely to retain the lessons from the characters they trust. Since most of the shows children watch tend to display gender stereotypes, especially the stereotype of men being good in STEM, children are likely to enforce these stereotypes. The increase of women in STEM has increased interest in STEM for girls, but boys still tend to hold more rigid gender bias. In this study, we were interested in the potential association between children's preference for masculine or feminine television shows and their perceptions of women in STEM. We recruited 22 children and their parents and gave them a packet with questions measuring stereotype awareness, stereotype flexibility, and stereotype endorsement; questions measuring television preference; and a worksheet to draw a scientist and a teacher. The results showed a clear association between the type of television preferred (masculine or feminine) and the gender of the scientist in their drawings ($p < .05$). A comparison of the equitable, male-bias, and female-bias scores for the stereotype measures also demonstrated a significant difference between television preference groups ($p < .05$); specifically, those children who preferred feminine television scored higher on female-bias for stereotype endorsement (women "should be good" at STEM) than those who preferred masculine television. This study overall supports the correlation between television preference and STEM as a gendered field.

Young Children's TV Show Preferences and Perceptions of Women in STEM

Recently, there has been an increase of women entering into the STEM fields. As of 2013, 49% of scientists in biological studies were women compared to 28% in 1960; 35% of scientists in chemistry were women compared to 8%; and 11% of scientists in physics and astronomy were women compared to 3% (Miller et al., 2018). However, there is still a long way to go until true equality is reached, and there still is an effort to push back on this change. For example, women are less likely to be recommended for a job for "brilliant" individuals (Bian et al., 2018). Many teachers in fact still have the idea that men are supposed to go into STEM fields while women go into humanities or become stay-at-home moms (Kollmayer et al., 2016). Unfortunately, this pushback is seen even in young children (Kollmayer et al., 2016; Lui et al., 2013) who tend to internalize what they see and experience within their cultural and familial environments.

The problem of women being underrepresented in STEM fields and careers is based on long-held stereotypes about the abilities of men and women, and these stereotypes have implications for societal expectations for what males and females *should* be like and what they *should* be able to do. Importantly, stereotypes are beliefs that are widely held but are largely untrue, oversimplified, and overexaggerated. However, it is true that gender stereotypes have roots in real biological differences between men and women – for example, women's ability to have children. This particular ability identifies women as nurturers and this identity extends to the community and to relationships beyond the caregiving role. In contrast to this perception, men do not need to be nurturing but they must be independent, assertive, and strong. These later characteristics are related to perceptions of what it takes to be successful within many STEM fields (Kollmayer et al., 2016).

Socialization and Gender Role Development

Why do these stereotypes prevail even though they are not accurate? It seems that we keep them alive through our societal norms, expectations, and the socialization of our children. Children are easily molded through their environment, for better or for worse. Individuals such as their parents, their teachers, and their friends help shape their beliefs and their behavior.

As children develop, they are discovering multiple aspects of themselves, including their gender. When children grow, they work to develop their gender and what this means to them. Regarding research on gender-role development, daughters were typically enforced femininity by their parents, usually by their fathers who demonstrated overprotectiveness of their daughters from other men, while mothers tend to enforce masculinity on their sons, by enforcing more chivalrous attitudes in their sons (Lipowska et al., 2016). In addition, children are aware of the idea that women are meant to be the caretakers, and research has shown that children attempt to enforce this even on their parents (Lui et al., 2013). In schools, teachers tend to view mathematics as an innate quality in young boys, while girls must make an effort, and that if girls fail math, it's due to an innate lack of talent, while if boys fail, it's due to a lack of effort to grow their innate talent (Kolmayer et al., 2016).

Children, just as any group, are more likely to have an in-group bias when it comes to gender differences, that is believing the gender group they associate themselves with are superior compared to the other. Even in STEM, boys and girls tend to believe their own group to be smarter when it comes to math and science (Bian et al., 2018; McGuire et al., 2020). Interestingly, in younger children and in boys, the in-group intelligence bias is stronger than in older children and girls (Bian et al., 2018; Kanka et. al., 2017; McGuire et al., 2020). One study asked children of various ages their opinions of women in STEM in an informal survey at a

children's science center. Specifically, these children were measured on stereotype awareness (*usually* good), stereotype flexibility (*can be* good), and stereotype endorsement (*should be* good). The study found that children ages five to eight tended to harbor a strong in group bias, while children over the age of twelve tend to hold more equitable points of view (McGuire et al., 2020).

Socialization through Television

People, including children, tend to build schemas through their experiences. These schemas, or cognitive frameworks, are built through the environment children live in and how they interact with that environment. For better or worse, this environment includes television, especially now that it's become a huge staple in modern American households. Households across America have reported that the average amount of minutes spent with the television on is roughly 232.2 minutes a day (LaPierre et al., 2012). Children are highly influenced by television. Starting with the Bobo Doll experiment (Bandura et al.,1961), which measured the aggression of children after watching an aggressive figure on-screen versus watching a kind figure, children have consistently been found to mimic the behaviors and beliefs based on their favorite television shows. Bandura's research supported his foundational theory of observational learning, in which children learn through observation and will mimic the behavior that they see, including behavior they see on television. However, not every character will affect a child's behavior or beliefs to the same extent. Children tend to identify with the character that looks like them, and that may include something as simple as gender identity (Leaper et al., 2002). Children tend to relate to and act more like characters that look like them, which may be harmful as television tends to demonstrate more character stereotypes than not (Hamlen et al., 2019; Signorielli, 1990). Because characters are portrayed in stereotypical ways, they tend to have

more stereotypical jobs and may limit what children believe they can grow up to do in the workforce (Signorielli, 1990).

As children get older, they tend to think more critically in terms of gender and to be able to determine a career path regardless of gender (Kanka et al., 2017). In several studies starting from 1966 and most recently in 2016, children were asked to draw a scientist in order to analyze the gender associated with the word science. Compared to the 1960s, in which 99.4% of scientists were drawn as male, children are more likely now to draw a female scientist compared to a male one, however, 74% of the time a male scientist is still drawn and girls are still more likely than boys to draw a female scientist (Miller et al., 2018). The gender of the scientist in the drawing gives insight into what children think of when they think of a scientist, therefore the more participants draw a female scientist, the more participants associate women with STEM fields.

Because television is such a large influence on young children, there has been evidence to support that children's intelligence bias could stem from these shows. Children develop very strong relationships with television characters, especially ones who tend to relate to the protagonist (Schlesinger et al., 2016). When looking at the television shows however, ties to intelligence bias are extremely present. Shows aimed towards boys were more likely to use STEM terms while shows aimed towards girls used general education terms or humanities terms (Hunting et al., 2017). Within the shows themselves, protagonists tended to be male, and teachers of STEM concepts were more often male as well (Aladé et al., 2020). In addition, male characters in television shows aimed for children were more likely to hold a leadership role in the group and more likely to make decisions (Hamlen et al., 2019).

Research does support that children internalize such ideas, especially young boys. In one German study, after showing a clip from a popular German show emphasizing that being good at math was a male trait, boys reported feeling that they outperformed girls when it came to math, while girls reported feeling no differently about their math performance (Wille et al., 2018). In another study, after being shown a clip from a male-targeted show and a female-targeted show, boys reported feeling less trust in the teacher within the feminine show and a greater trust in the teacher from the masculine show, while girls, although relating better to the characters from the female shows, trusted both teachers equally (Schlesinger et al., 2017).

Research Question and Hypothesis

Based on the previous research, there is an association between early environmental experience, including media and television exposure, and endorsement of gender role stereotypes. This association has implications for children's beliefs about career-related gender-role stereotypes, as well as ultimately career choice and perceptions of others in those careers. Further, this process appears to be different based on one's own gender as well. The research question for the current study was to what extent do the educational television shows elementary school children prefer to watch, whether masculine, feminine, or neutral, predict their attitudes and trust towards women in STEM occupations? It was hypothesized that if children tend to or prefer to watch feminine or neutral educational shows, then they would be more willing to trust and accept women in STEM based on their responses to the stereotype questionnaire and they would be more likely to draw a picture of a female scientist as their ideal. This study also explored potential gender differences regarding these associations.

Method

Participants

Children between the ages of 5- to 10-years and their parents were recruited for participation in this study. Recruitment procedures included an advertisement listed in the faculty and staff daily campus email update, *Bellarmine Today* (see Appendix A), as well as word of mouth appeals to Bellarmine students with children of their own and/or family members (e.g., siblings, nieces, nephews, etc.) that were suitable for the age inclusion criteria. Bellarmine faculty, staff, and students who were interested in participating contacted the investigators to obtain a questionnaire packet and to choose a toy.

Descriptive statistics for the participants are listed below. Participants were 22 children ages 5-12. Participants were 54% girls and 45% boys. Forty-one percent (41%) reported having a primary female caregiver with a STEM-related career and 59% reported having a primary female caregiver without a STEM career; 18% reported their primary female caregiver having a bachelor's degree as their highest, 40% reported their primary female caregiver having a Master's degree as their highest, 27% reported their primary female caregiver having a Doctorate as their highest, and 14% answered other. Also, 82% reported having siblings in the home, while 18% reported no other siblings. Out of the participants with siblings, 54% reported at least one older sibling, and 36% reported at least one younger sibling. Finally, 59% reported having at least one sister, and 45% reported having at least one brother.

Materials & Procedure

Research materials included one questionnaire packet (i.e., an informed consent document, a brief questionnaire including demographic information and perceptions of STEM careers, a listing of TV shows grouped by intended audience – masculine, feminine, or neutral – two blank pages for drawing, and a paid-postage return business envelope) and a small toy incentive. For their participation, children were invited to choose one item from an assortment of

small, inexpensive, yet colorful and attractive toys. Children were able to keep the toy regardless of their participation status – whether they returned a fully completed packet, a partially completed packet, or no packet at all.

The first component of the questionnaire packet was the informed consent document (Appendix B). This document invited parents and their children to participate in the research study and described the procedures, duration, incentives, benefits, and potential risks to participants. The contact information of the investigators was also included. Participants were encouraged to keep this document for their records. Parents and participants were instructed not to put any names on the packet. Participation was fully voluntary and participants and parents were advised that if they choose not to complete the study, there would be no penalties. The informed consent document also gave contact information of the IRB that reviewed the study to discuss any questions with full confidentiality about the study and their rights as a participant.

The second component of the questionnaire packet included a series of demographic and general background information questions (Appendix C). Participants were asked specifically about the career-role of the primary caregivers and the education level of the primary caregivers. They also were asked about the child's age and gender and corresponding information about siblings. Parents of the participants were instructed to answer these questions on the participants' behalf, due to the age of the participants.

The third component of the packet included a series of questions to assess the child's perceptions of STEM careers, and specifically who they thought would be "good" at science, technology, engineering, and math (Appendix C). Specifically, children were asked who is "usually good" (i.e., stereotype awareness), who "should be good" (i.e., stereotype endorsement), and who "can be good" (i.e., stereotype flexibility) in these career fields – boys, girls, or both

boys and girls. Age-appropriate examples of each of the four categories were given to ensure an understanding of the questions. For example, science was described as “conducting experiments, testing hypotheses, making observations; technology was described as “working with machines and devices like computers”; engineering was described as “designing cars, airplanes, and robots; building skyscrapers and bridges”; and math was described as “working with numbers, data, models, graphs”. These survey questions were taken from McGuire (2020). Parents were instructed to ask child participants these questions verbally and record their responses on the packet.

Next was a colorful worksheet with questions about their television habits. Participants were asked to report if they liked to watch TV and how often they did so on average through the week. Participants were asked to select TV shows that they would be most interested in watching (Appendix D). Shows were organized into eight groupings or rounds with three shows per group. Each show was coded as masculine, feminine, or neutral, and each grouping included one show that represented each gender-related designation. The gender-related designation for each TV show was determined by systematically polling college students for their experience and opinion regarding the intended “target audience” of 52 of popular TV shows for children. The TV shows that were unanimously rated as “masculine”, “feminine”, or “neutral” after four iterations of ratings were selected for use in the current study and were categorized accordingly. “Masculine was defined as “geared towards boys”, “feminine” was defined as “geared towards girls”, and neutral was defined as “being neither fully geared towards girls nor boys”. In the end a total of 24 TV shows were included in the study with eight categorized as masculine, eight as feminine, and eight as neutral. The questions and the TV rounds were formatted as a worksheet similar to one they may come across in school. Parents were again instructed to ask the participants each

question verbally and record their answers. Participants were asked to pick one show per round they feel most interested in watching through circling the preferred show.

Then, there were two sheets of paper with unique instructions. One asks participants to draw a scientist (Appendix E) and the other asks participants to draw a teacher (Appendix F). A large amount of space was given for each to give as much room as possible for a picture. These were structured similarly to drawing worksheets participants may come across in school. The Draw-a-Scientist measure was taken from Miller (2018) as a reliable measure.

Finally, each questionnaire packet included a postage-paid business envelope. The envelopes had a return address back to Bellarmine University to return to the experimenters. This project was reviewed by Bellarmine's IRB. (See Appendix G)

Results

Draw-A-Scientist

Participants were grouped into "masculine preference" ($n = 7$) or "feminine preference" ($n = 6$) based on their responses to the TV show prompts. A few children ($n = 9$) were not included in the grouping due to them having no clear masculine or feminine preference for TV shows or because the drawings could not be interpreted as either male or female. Using a Chi Square Test of Independence, the "Draw a Scientist" (man, woman, or undecipherable) results were compared for these 13 children. The results of this analysis indicated a significant difference between children with a masculine preference for TV shows and those with a feminine preference in terms of their illustrations of a scientist, $\chi^2 = (1, N = 13) = 6.195$, $p < .05$. Consistent with the hypothesis, those children who preferred to watch masculine TV shows tended to draw a male scientist, and those children who preferred to watch feminine TV shows tended to draw a female scientist. See Table 1.

Table 1

Frequencies of Male and Female Scientists Drawings for Children Who Preferred Masculine or Feminine TV Shows

	Masculine TV Preference	**Feminine TV Preference**	**ROW TOTALS**
Male Scientist	6(3.78)	1(3.23)	**7**
Female Scientist	1(3.23)	5(2.77)	**6**
COLUMN TOTALS	**7**	**6**	**13**

These same participants were grouped into "masculine preference" (n=7) or "feminine preference" (n=7). An additional participant was added due to the ability to code the drawing of the teacher as either male or female. Using a Chi Square of Independence, the "Draw a Teacher" (man, woman, or undecipherable) results were compared for these 14 children. The results of this analysis did not indicate a significant difference between those who report preferring masculine TV shows and those who report a feminine TV preference in terms of their teacher pictures, χ^2 = (1, N = 14) = 3.82, p > .05. Note, this calculated value narrowly misses the critical value of 3.84, and the frequencies reported suggest a teacher female-bias for those children who prefer to watch feminine TV shows. See Table 2.

Table 2

Frequencies of Male and Female Teacher Drawings for Children Who Preferred Masculine or Feminine TV Shows

	Masculine TV Preference	**Feminine TV Preference**	**ROW TOTALS**
Male Teacher	3(1.5)	0(1.5)	**3**
Female Teacher	4(5.5)	7(5.5)	**11**
COLUMN TOTALS	**7**	**7**	**14**

An additional Chi Square analysis compared the frequency of female teachers and female scientists drawings as function of the masculine or feminine TV preference groupings of the children. There was an interesting pattern of frequencies; namely, of those children who preferred masculine TV shows, only one of them drew a female scientist while four of them drew a female teacher. This is in contrast with the nearly equal distribution of female teachers and scientists in the "feminine TV preference group". However, these patterns were not statistically different from what might be expected, as the results of this analysis did not indicate a significant difference between those who report preferring masculine TV shows and those who report a feminine TV preference in terms of their female teacher and female scientist drawings, $\chi^2 = (1, N = 18) = 1.77, p > .05$. See Table 3.

Table 3

Frequencies of Female Teacher and Female Scientist Drawings for Children Who Preferred Masculine or Feminine TV Shows

	Masculine TV Preference	**Feminine TV Preference**	**ROW TOTALS**
Female Teacher	4(2.7)	6(7.2)	**10**
Female Scientist	1(2.2)	7(5.7)	**8**
COLUMN TOTALS	**5**	**13**	**18**

Gender Stereotypes

To measure potential differences in stereotype awareness ("usually good"), endorsement ("should be good"), and flexibility ("can be good") for the masculine TV preference and feminine TV preference groups, three 2 (TV preference groups: masculine or feminine) X 3 (equitable, male-bias, or female-bias) mixed factorial ANOVAs were performed. Children were given individual scores under equitable bias, male bias, and female bias for each measurement of stereotype awareness, endorsement, and flexibility. These scores were created by summing the child responses in each category. Specifically, for their equitable score for stereotype awareness, children were given a "4" if they answered "both boys and girls" to every item and were given a "0" if they never answered this way. The same scoring pattern was used for the male-bias scores ("4" if all responses were "boys" and a "0" if no responses were "boys") and for the female-bias scores ("4" if all responses were "girls" and a "0" if no responses were "girls") for each stereotype category.

These scores were then compared between the TV preference (masculine or feminine) groups across the three stereotype measures. There were no significant differences found

between the masculine and feminine TV preference groups for stereotype awareness ("usually good") measures, all F's < .26, all p's > .78. Likewise, there were no significant differences found between the masculine and feminine TV preference groups for the stereotype flexibility ("can be good") measures, all F's < .96, all p's > .401. However, there was a significant difference found for the stereotype endorsement ("should be good") measures between the masculine and feminine TV preference groups for the female bias score, $F(2,19) = 3.50$, $p = .051$, $\eta^2 = .067$. Specifically, the female-bias score stereotype endorsement, $t(16) = -2.45$, $p = .026$ (2-tailed), was significantly higher for those children who preferred to watch feminine TV ($M = 1.14$, $SD = 1.21$) compared to those who preferred to watch masculine TV ($M = .18$, $SD = .40$). No other significant differences were revealed, although there were some interesting patterns. See Figures 1, 2, and 3 for a summary of the analyzed means.

Figure 1

Stereotype Awareness Averages for Masculine and Feminine TV Preference Groups

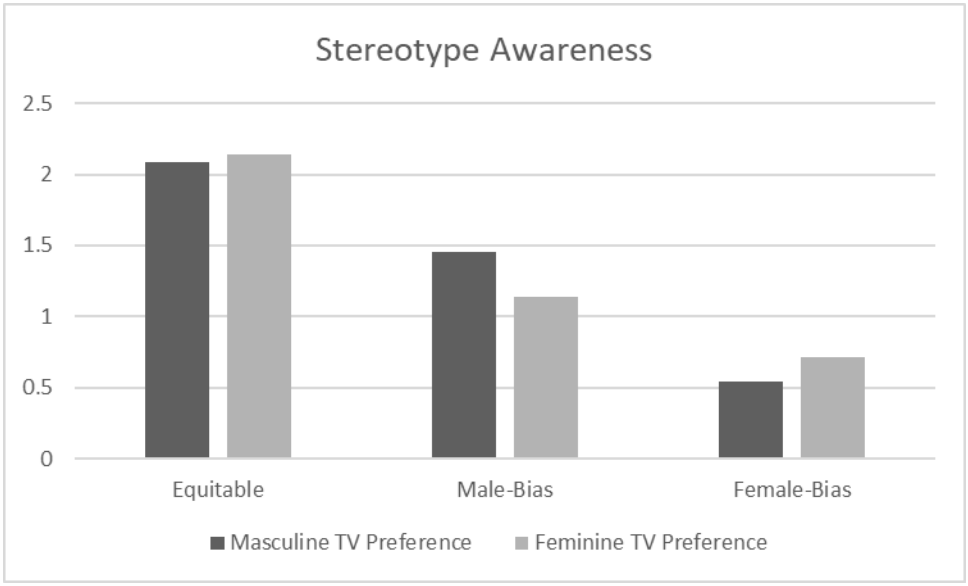


Figure 2

Stereotype Endorsement Averages for Masculine and Feminine TV Preference Groups

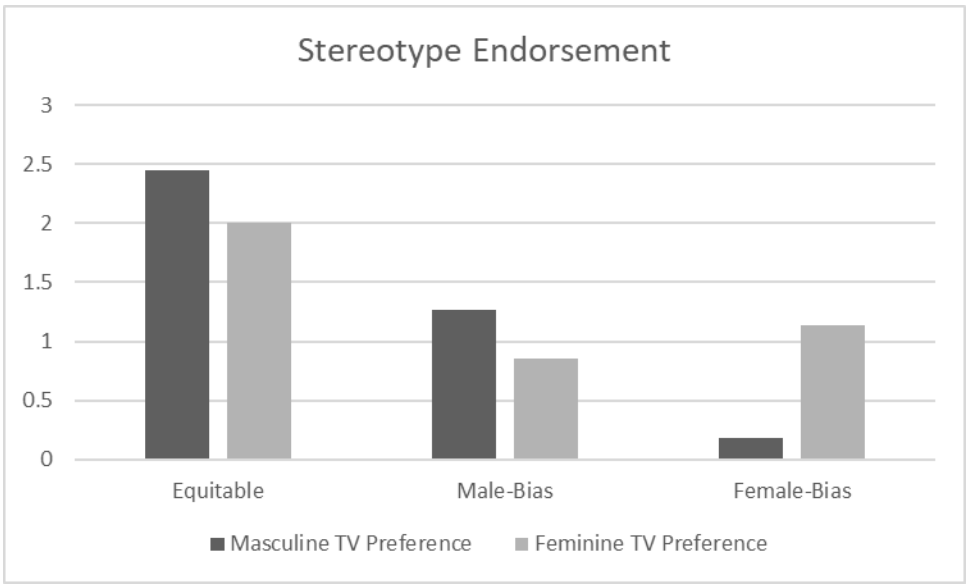
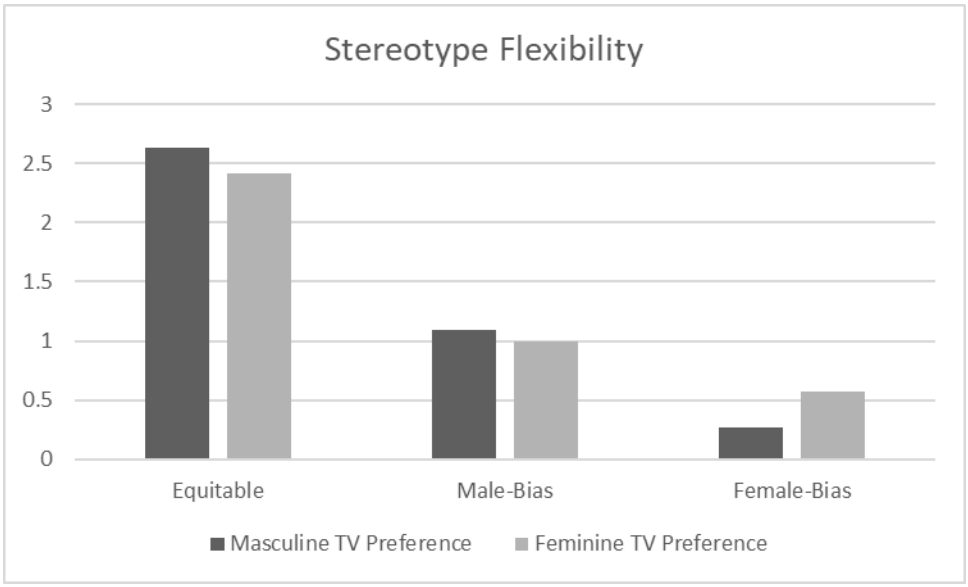


Figure 3

Stereotype Flexibility for the Masculine and Feminine TV Preference Groups



These findings collectively support the hypothesis that children who tend to watch coded feminine TV shows are more likely to draw a female scientist and are more likely to demonstrate

selective trust of women in STEM – specifically believing that women (more than men) "should be good" at STEM careers.

Discussion

The purpose of this study was to explore an association between the television shows that children prefer and their attitudes towards women in STEM. Based on previous literature (e.g., Aladé et al., 2020; Hunting et al., 2017; Schlesinger et al., 2016; Schlesinger et al., 2017; Wille et al. 2018), it was hypothesized that children who tend to prefer feminine television shows would have a stronger selective trust and identification with women in STEM careers based on their responses to the stereotype assessment and more likely to hold women figures in their ideal, meaning they would be more likely to draw a female scientist.

The results largely support the hypotheses in that more participants than statistically expected drew a female scientist when they displayed a feminine preference in TV shows. This supports the notion that children develop schemas from their environment, including what they watch on television. Children spend a substantial amount of time on television, all of our participants self-reported that they watch television either every day of the week or almost every day of the week. The results support that children when watching television shows are perceptive to the gender stereotypes within the shows, and these stereotypes within the shows shape their beliefs and perceptions of STEM as a gendered field. Children are aware of the role they are meant to follow based on their gender (Kanka et al., 2017; Kollmayer et al., 2016). This study shows how television may play a role in forming a child's schema, alongside their household and school environments. Of course, as this research study was necessarily correlational in nature, it also is possible that children already hold strong gender stereotypes based on their own gender experiences and in-group biases and these feelings and beliefs are what predicts their choice of

TV programming type, masculine or feminine. Future research should attempt to disentangle these confounds.

The results also showed that children who preferred feminine TV shows displayed a stronger female bias in stereotype endorsement. This means that children who preferred feminine TV shows also believed that women "should be good" in STEM related fields and careers. This suggests that children could be learning about societal norms and expectations during the TV viewing. However, the results did not support the hypothesis that children who prefer feminine TV shows would have a stronger female bias in stereotype awareness or stereotype flexibility, although there were some interesting patterns. Many children held an equitable view of stereotype awareness, flexibility, and endorsement regardless of television preference, but it is interesting that there's a pattern beginning to emerge in that children who preferred masculine television appeared to have more of a male bias. Children with a feminine television preference did appear to have a female bias. Additionally, it is worth noting that more children tended to have a masculine bias in stereotype awareness, endorsement, and flexibility than a feminine bias, regardless of television preference. Children who preferred feminine TV shows did however tend to display a stronger feminine bias in stereotype endorsement.

Television assumes a sizeable presence and plays a large role in the life of children. All our participants answered on our survey that they watched television at least most of the time. It is no question that television influences the behavior of children (e.g., Bandura et al., 1961), especially when they attempt to mimic the characters with which they can identify. What is interesting is the idea that children's beliefs and schemas about the world, even societal expectations and norms, may be associated with television viewing as well.

A majority of the female caregivers reported having at least a Master's degree and just under half reported having a STEM-related career. Because of the high education and STEM-related careers of the primary female caregivers for the majority of the participants, this variable is our control in this study. It was previously believed that parents provided the strongest influence on their children's behavior and beliefs (Lipowska et al., 2016). However, our participants who preferred masculine television shows, regardless of their primary female caregiver's education level and connection to STEM, were still more likely to draw a male scientist over a female scientist. This study lends support to the idea that television can influence the behavior and beliefs of children, perhaps even above and beyond that of parental and immediate environment experience.

Society has made substantial progress when it comes to female representation in STEM fields. More and more women have joined STEM and have paved the way for many other younger generations to join STEM as well. From the perspective of the current research findings, it is easy to see the connection, more and more girls and those who watch feminine-coded television tend to endorse female representation in STEM. There is a link of female endorsement to feminine television preferences. The majority of these female television shows have a female protagonist and the viewers of these shows do appear to be mostly female. One could argue that the correlation therefore is simply identification.

However, that does not speak to the girls that additionally drew male scientists or had a masculine preference in television shows. In our study, we had two female participants with a masculine television preference, and both were older children in our sample. This supports the notion that girls can selectively trust both male and female teachers in STEM. Notably, within our sample, the number of boys that reported a feminine preference in television shows was zero.

In fact, most boys both reported a masculine television show preference as well as drew a male picture of a scientist. It would be interesting to measure why more girls prefer masculine television than boys that prefer feminine television. Boys appear to adhere to masculinity far more strongly than girls to femininity, which is reflected in this study (Schlesinger et al., 2017; Wille et al., 2018; Miller et al., 2018). Masculinity is tied to aggressiveness, independence, and decisiveness as well as STEM (Kollmayer et al., 2016), and deviance from this could be seen as a fault, many teachers have reported feeling that a boy who is not performing well in math is not living up to their potential, while a girl not performing well is not naturally gifted at math (Kollmayer et al., 2016). It may be that the need to adhere to masculinity, including believing boys are more naturally gifted at STEM, could play a role in television preference. In return, the television boys consume only affirms their beliefs that boys are more likely to perform better in STEM.

There were several limitations to our study. Namely, a small sample size was used, leading to calculations deeming some findings insignificant when they may be significant with the increased power of a larger sample size. In addition, children connected to the university were the children surveyed, which consists of mostly middle or upper-class children. The results may be different with a more diverse sample.

Importantly, the majority of children within our study additionally tended to prefer feminine shows if they were girls and masculine shows if they were boys. This perhaps is the single-most-important confounding variable of the research project. This was unavoidable and based on the children's own preference, but it could mean that due to the in-group bias, children prefer their own gender when it comes to STEM and television shows.

Future research should look at the potential differential role that age plays within intelligence bias. In addition, the role of the parent when it comes to policing the television shows their children watch should be studied. A similar study measuring race would additionally be interesting to study, as well as differences between education levels or classes. In conclusion, television plays an important role in children's lives and it may be helpful to expose children to both masculine and feminine shows in order to encourage more positive attitudes towards women in STEM.

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Appendices

Appendix A: Participant Recruitment Advertisement

STEM Research: Seeking participants aged 5-10 years

Senior Honors student, Lauren Berck is actively recruiting participants for her research project exploring associations between TV show preferences and perceptions of STEM careers in children between the ages of 5-to-10-years. Participation in this study includes the completion of a short questionnaire packet that can be completed at home with your child and returned to campus in a pre-paid envelope. Responses are completely anonymous, and children will receive a small, inexpensive toy for their participation. If you are interested in obtaining a packet and toy for the child/children in your life or if you have any questions about the study, please contact Lauren Berck (lberck@bellarmine.edu). Data collection has begun and will continue through December 15, 2021. The IRB has reviewed this study.

--Christy Wolfe

Appendix B: Informed Consent Document

Young Children's Favorite TV Shows and Attitudes Toward STEM Careers

Parent Permission Form

Dear Caregiver,

You and your child are enthusiastically invited to participate in a research study. The study is being conducted by Dr. Christy Wolfe (a faculty member at Bellarmine University) and Lauren Berck (an Honors Student). The study is sponsored by the Department of Psychology and the Honors Program at Bellarmine University. Participation in this study involves your child (with your help) completing the attached anonymous survey and then returning the survey to us in the attached, pre-paid envelope. Your participation in this study will last for approximately 10 minutes.

Purpose: The purpose of this research study is to explore the possible connection between the educational television shows watched during childhood and children's attitude towards careers in science, technology, engineering, and math (STEM). There are already connections between the characters in educational television shows and how well children retain the lessons based on how they relate to the characters, as well as how well children retain the lessons based on the gender of the character teaching the lesson in the educational television show. We think they shows that they watch might impact their perceptions of men and women in STEM.

Procedures: In this study, **with your help**, your child will be asked to list their favorite TV shows and how often they watch them. They will be asked to choose a TV show that interests them the most from a series of TV show lists. Your child also will be asked a few questions about their STEM stereotype awareness; for example, "Who is usually good at science?". Finally, your child will be given a blank piece of paper and asked to draw a picture of a scientist and a picture of a teacher using crayons, colored pencils, pens, or any writing utensil. **There are no right or wrong answers.** Please allow your child(ren) to respond and to draw naturally. We are curious about what *they think* at this time, not what *they should* think.

Potential Risks: There are no foreseeable risks. No deception will be used. No sensitive or identifying information will be collected.

Benefits: The possible benefits of this study include potentially understanding a tie between television preferences and perceptions of STEM fields. The data collected in this study may not benefit you directly. However, the information learned from this research may be helpful to others in the future.

Confidentiality: A goal of this study is anonymity of responses. No identifying information will be collected from you or about your child. To maintain anonymity, please do not write your name or any identifying information on the forms or return envelope provided.

Voluntary Participation: You and your child's participation in this research study is voluntary. You may refuse to participate or withdraw your consent at any time without penalty or losing benefit to which you are otherwise entitled. You and your child are free to decline to do or answer any questions or tasks the researcher asks of you without penalty. Completion of this survey and returning it in the mail indicates that you are voluntarily agreeing to participate.

Your Rights as a Research Subject and Contact Persons: If you have any questions about your rights as a research subject, you may call the Institutional Review Board Office at 502.272.8032. You will be given the opportunity to discuss any questions, in confidence, with a member of the Board. This is an independent committee composed of members of the University community and lay members of the community not connected with this institution. The Board has reviewed this study. If you have any questions about the study, please contact Dr. Christy Wolfe (cwolfe@bellarmine.edu) or Lauren Berck (lberck@bellarmine.edu).

Appendix C: General Background Questionnaire & STEM Questionnaire

Young Children's Favorite TV Shows and Attitudes Toward STEM Careers

Part 1: Questions to be completed by parents or primary caregivers

1. How **old** is the child participating in the study? _____
2. What is the **gender** of the child participating in the study? _____
3. What is the **occupation** of the primary male and female caregiver (If none, answer N/A. If multiple, list all)?
    a. Primary male caregiver: _____
    b. Primary female caregiver: _____
4. What is the highest **education** of the primary male and female caregiver?
    a. Primary male caregiver: _____
    b. Primary female caregiver: _____
5. If the child participating in the study has any **siblings**, how many siblings does the child have, how old are each, and what is the gender of each (If the child has no siblings, answer N/A)?

Part 2: Questions to be answered by the child with the caregiver's help

Please read each question aloud to your child and record their responses. There are no right or wrong answers. Please allow your child(ren) to respond and to draw naturally. We are curious about what *they think* at this time, not what *they should* think. Examples of each STEM area are given for understanding.

Science: conducting experiments, testing hypotheses, making observations
Technology: working with machines and devices like computers
Engineering: designing cars, airplanes, and robots; building skyscrapers and bridges
Math: working with numbers, data, models, graphs

1. Who do you think is **usually good** at Science?
    a. Boys
    b. Girls
    c. Both Boys and Girls
2. Who do you think is **usually good** at Technology?
    a. Boys
    b. Girls
    c. Both Boys and Girls
3. Who do you think is **usually good** at Engineering?
    a. Boys
    b. Girls
    c. Both Boys and Girls
4. Who do you think is **usually good** at Math?
    a. Boys
    b. Girls
    c. Both Boys and Girls
5. Who do you think **should be good** at Science?
    a. Boys
    b. Girls
    c. Both Boys and Girls
6. Who do you think **should be good** at Technology?
    a. Boys
    b. Girls
    c. Both Boys and Girls
7. Who do you think **should be good** at Engineering?
    a. Boys
    b. Girls
    c. Both Boys and Girls
8. Who do you think **should be good** at Math?
    a. Boys
    b. Girls
    c. Both Boys and Girls
9. Who do you think **can be good** at Science?
    a. Boys
    b. Girls
    c. Both Boys and Girls
10. Who do you think **can be good** at Technology?
    a. Boys
    b. Girls
    c. Both Boys and Girls
11. Who do you think **can be good** at Engineering?
    a. Boys
    b. Girls
    c. Both Boys and Girls
12. Who do you think **can be good** at Math?
    a. Boys
    b. Girls
    c. Both Boys and Girls

Appendix D: Favorite TV Shows and Preferences

Favorite TV Shows and Preferences

Part 3: Questions to be answered by children with caregiver's help

Please read each question aloud to your child and record their responses. There are no right or wrong answers. Please allow your child to respond and draw naturally.

1. Do you like to watch TV shows? (circle one) Yes No Not sure

2. What are your favorite TV shows to watch right now? (please list all responses)

3. How often do you get to watch TV shows? (circle one)
   a. Less than once per week
   b. Once per week
   c. Two days per week
   d. Three days per week
   e. Almost every day of the week
   f. Every day of the week

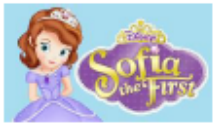
4. Each question below, presents three popular TV shows. Please ask your child to choose or circle the TV show that they would be most interested in watching.

   a. (Bob the Builder, Doc McStuffins, Magic School Bus)

   b. (PJ Masks, Minnie's Bow Toons, Little Einsteins)

c. (Sid the Science Kid, Pinkalicious, Daniel Tiger's Neighborhood)

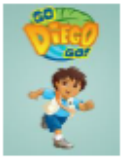

d. (Jake and the Neverland Pirates, Sofia the First, Super Why!)

e. (Handy Manny, Bubble Guppies, Sesame Street)

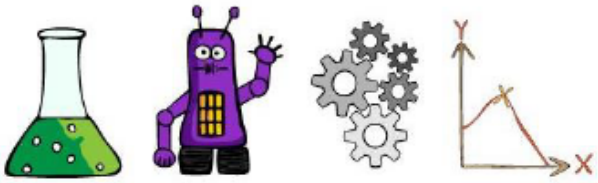
f. (Thomas and Friends, Sheriff Callie's Wild West, Cat in the Hat)


g. (Go Diego Go, Pinky Dinky Doo, Mickey Mouse Clubhouse)



h. (Paw Patrol, Elena of Avalor, Clifford)

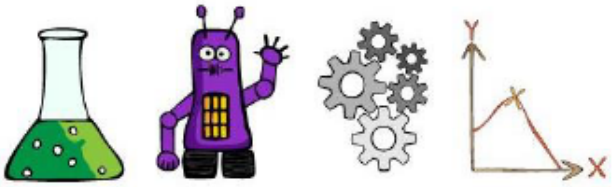
Appendix E: Draw A Scientist



Draw a Scientist!

Think about a scientist doing science. Can you draw a picture for me in the space below?

Appendix F: Draw A Teacher



Draw a Teacher!

Think about a teacher. Can you draw a picture for me in the space below?

Appendix G: IRB Approval Letter

From: Francis T. Hutchins
To: Christy D. Wolfe
Cc: Connie R. Smith
Subject: IRB 956
Date: Thursday, October 21, 2021 4:33:00 PM
Attachments: image001.png
image002.png

10/21/21
Dr. Christy Wolfe
Psychology, Bellarmine University
IRB #956, "Young Children's Favorite TV Shows and Attitudes Toward STEM Careers"

Dr. Wolfe,

The IRB has received your application for the project entitled "Young Children's Favorite TV Shows and Attitudes Toward STEM Careers." The project has been designated protocol #956. Your submitted protocol has undergone an expedited review and has been approved under the categories of "Collection of data through non-invasive means" and "Research on individual or group characteristics or behavior (perception, cognition, motivation, language, communication, cultural beliefs or practices, social behavior)." The review period extends until Oct. 21, 2022. Please inform us in advance of any changes that may be made to the protocol in the course of this study. If this study is completed before the end of the review period, please submit a Termination Form found on the IRB website below.
http://www.bellarmine.edu/academicaffairs/effective/research-and-creativity/irb/
If you have any questions, please feel free to contact me. We wish you the best with your project.

Regards,

Dr. Frank Hutchins

Professor of Anthropology
Bellarmine University
2001 Newburg Rd.
110A Pasteur Hall
Louisville, KY 40205

502-272-8393
fhutchins@bellarmine.edu