

# Understanding the role of pervasive negative gender stereotypes: What can be done?

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May 2007, Heidelberg, Germany

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**Congress considers women in science.** (1998). *Science and Technology in Congress.*

**Study to look into women's role in sciences.** (2007). *South China Morning Post.*

**The paradox of critical mass for women in science.** (1994) *Science.*

**Why female academics drop out: 'It's not rocket science',** (2007) *The Gazette (Montreal).*

**MP's WARNING: Science needs more women.** (2007). *The Advertiser, Australia*

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## No credit where credit is due: Attributional rationalization of women's success in male-female teams

Heilman, M. E., & Haynes, M. C. (2005). *Journal of Applied Psychology*, 90(5), 905-916.

## Same behavior, different consequences: Reactions to men's and women's altruistic citizenship behavior

Heilman, M. E., & Chen, J. J. (2005). *Journal of Applied Psychology*, 90(3), 431-441.

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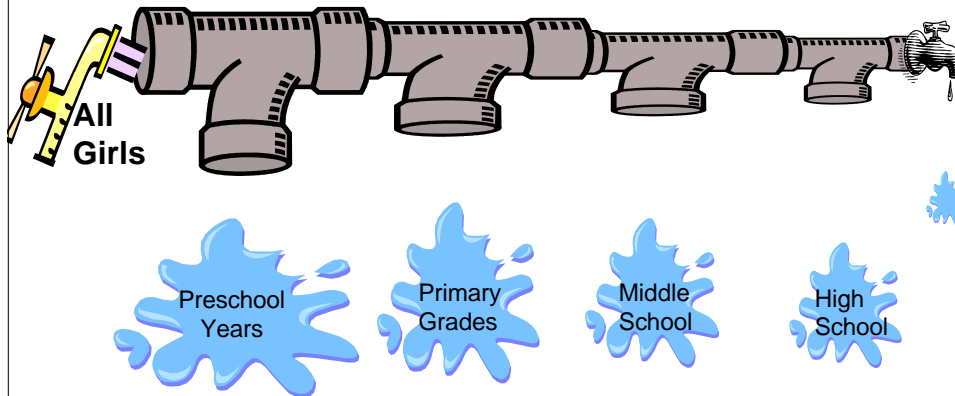
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I believe that girls' disinterest  
and lack of confidence in their  
ability to succeed in math and  
science has its roots in their  
very early years.

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## Leaky Pipeline



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Parents and teachers are key players in the career paths young girls eventually pursue.

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The preschool and primary grades are the years in which the foundation is laid upon which other influences will have effects.

To the extent that I am right, the policies and interventions that flow from this analysis will be very different, from those usually considered when serious attention is given to correcting the gender gap problem in the sciences.

# The Eccles' Model

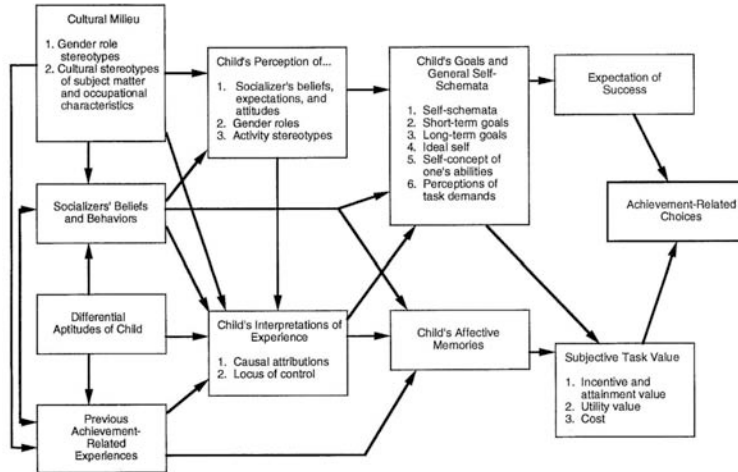
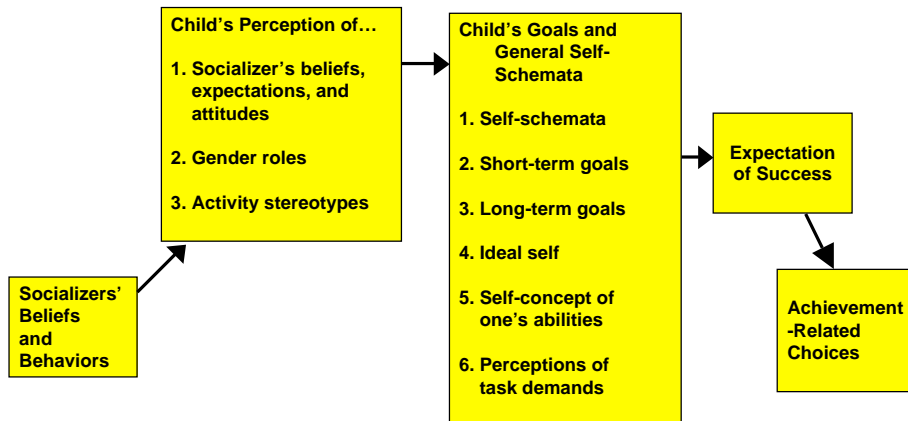


FIGURE 1. Theoretical model of achievement-related choices developed by Eccles (Parsons), Adler, Futterman, Goff, Kaczala, Meece, and Midgley, 1983.

# The Eccles' Model



**Parents**



**Teachers**



**Toy Marketers**



**Media**



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## **Boys and Girls Are Different:**

- They learn differently
- They have different innate abilities
- They are best suited for different occupations
- Boys have higher math ability than girls
- Girls have higher verbal ability than boys
- They want different things out of life

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- Of course, boys will be boys!
- Of course, boys will engage in more rough and tumble play!
- Of course, girls will be less aggressive and more interested in passive pursuits!
- Of course, girls will be more caring and relational!

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How does this difference message affect parents' behaviors towards their boys and girls?

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Children often participate in science-related activities with their parents.

Does parents' science-related behavior differ by their child's gender?

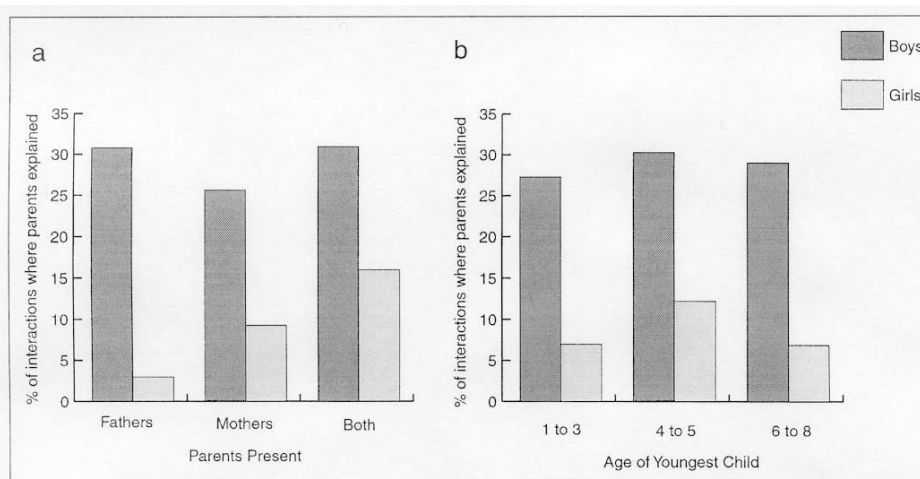


## What did the researchers find?

- Boys and girls were not significantly different in whether they initiated engagement with the exhibits.
- The vast majority of boys and girls were actively involved in manipulating the exhibits.
- The mean length of time children remained engaged with an exhibit showed no significant gender difference.

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Crowley, K., Callanan, M. A., Tenenbaum, H. R., & Allen, E. (2001). Parents explain more often to boys than to girls during shared scientific thinking. *Psychological Science*, 12(3).

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The crucial step of providing explanatory context for the interactive experience was primarily reserved for boys.

Parents may be involved in creating gender bias in science learning years *before* children's first classroom science instruction.

Although the study was set in a museum, the key aspects of the interactions characterize many of the everyday activities in which early scientific and technical thinking are first constructed – building with blocks, mixing watercolors, or figuring out how a new computer game works.

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Elementary school boys had stronger beliefs in their own competence in mathematics than girls and these beliefs did not change over a 3-year period

(Wigfield, Eccles, Yon, Harold, Arbreton, Freedman-Doan, & Blumfeld, 1997).

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Even when children are very young, teachers and parents in the U.S. and Europe hold gender differentiated views of their children's academic abilities.

These beliefs are more gender differentiated than are objective indicators of the children's actual performance.

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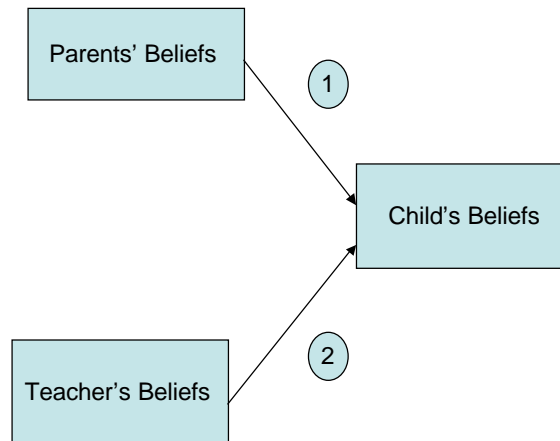
Children's self-perceptions of ability are linked to parents' and teachers' beliefs.

These linkages become stronger with age.

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## The Power of Beliefs About Math Ability



Tiedemann, J. (2000). Parents' gender stereotypes and teachers' beliefs as predictors of children's concept of their mathematical ability in elementary school. *Journal of Educational Psychology*, 92(1), 144-151.

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Clearly, children form their self-perceptions not just on the basis of their own and their classmates' performance.

Parents' and teachers' gender-differentiated messages account, in part, for children's self-beliefs.

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"No, no, Larissa," she said.

"I need a boy to do this."

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Parents of sixth-graders who held traditional gender stereotypic beliefs favoring boys in mathematics expressed less confidence in their children's math abilities and less favorable perceptions of their children's abilities to succeed in math over a two-year period if they had daughters and more confidence if they had sons, **regardless of their children's actual abilities and performance levels**

(Jacobs, 1991).

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Fourth-grade girls and boys show about the same interest in math and science, but twice as many eighth-grade boys as girls show an interest in these subjects.

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The gap between boys' and girls' ability levels in math and science has decreased substantially since the early 1980's, with girls outperforming boys in some cases, yet girls still report lower self-efficacy and self-perceptions in math and science, often greatly underestimating their abilities

(Bleeker & Jacobs, 2004, p. 98).

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Several studies suggest that an individual's self-perception of ability is related to career choice more than an individual's actual ability.

What are the long-term effects of mothers' beliefs on their children's math and science career choices?



- Research suggests that over time, children construct their own self-perceptions and interests which are based on their parents' messages.
- Children then integrate these beliefs into their own self-beliefs, and
- Ultimately use these beliefs in such future task choices as choosing a college major or career.

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Students identify parents as the strongest influence on career and course decisions.

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- Life science-business careers
  - health assessor
  - business supervisor
  - health technologist
- Physical science-computing careers
  - mathematician
  - computer scientist
  - engineer
- Non-science careers
  - lawyer
  - retail worker
  - jobs associated with food preparation

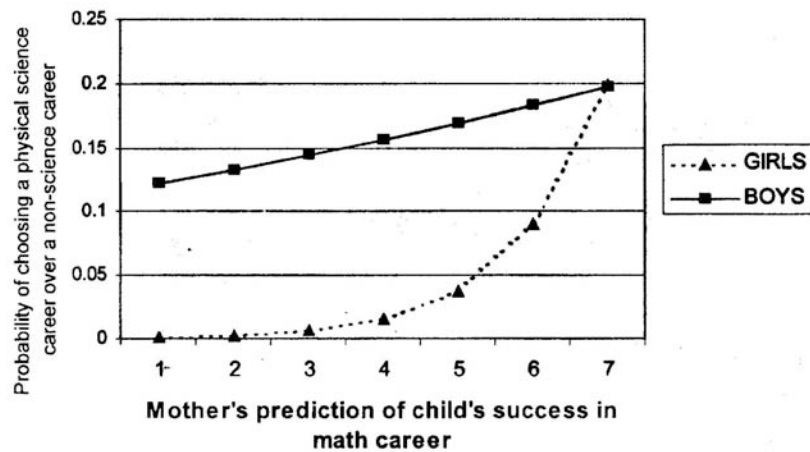


Figure 2. Relation between mothers' perceptions (sixth grade) and young adults' career choices (age 24–25 years): Probability of physical science over non-science.

Bleeker, M. M., & Jacobs, J. E. (2004). Achievement in math and science: Do mothers' beliefs matter 12 years later? *Journal of Educational Psychology, 96*(1), 13.

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What effect do gender stereotypes have on the post-college plans of college-age students?

## Sample Items

- In general, men may be better than women at math.
- I don't think that there are any real gender differences in math ability.
- It is possible that men have more math ability than do women.

**24% of the sample indicated  
that the stereotype is true.**

- **Less confidence in their ability to succeed**
- **Less desire to attend graduate school in one's major**
- **Lower performance self-esteem**
- **Lower confidence in one's abilities**

## We have a paradox

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On the one hand, we have declining gender differences in performance on math and science indicators during adolescence.

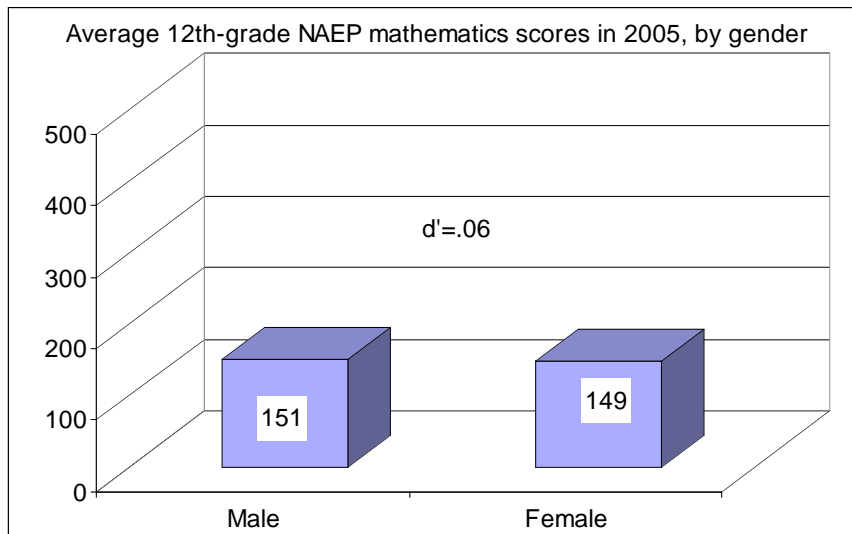
On the other hand, we have continuing and in some cases increasing gender differences in employment in math and science fields.

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Unless we actively combat pervasive negative gender stereotypes when children are very young, little improvement in the representation of girls in math and science is likely.

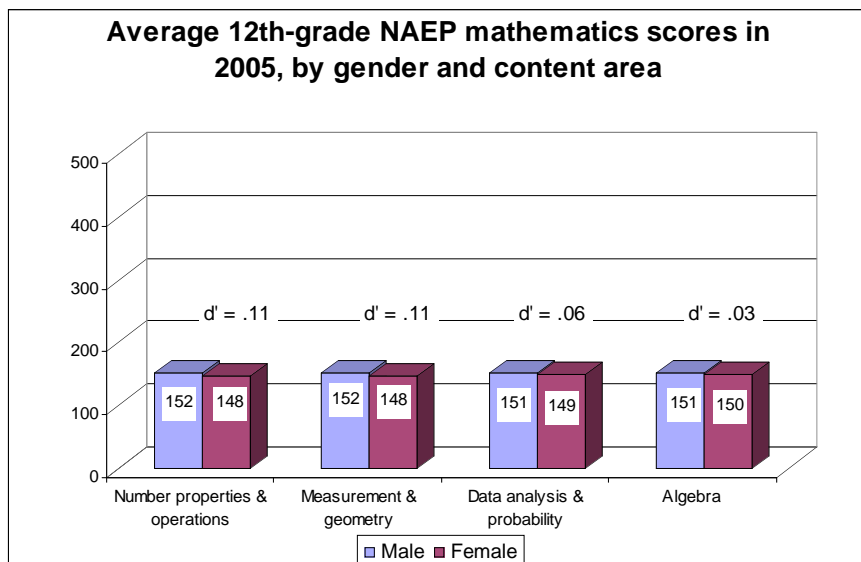
## Math and Science Abilities Today



IES National Center for Education Statistics. (2007). *The nation's report card: 12th-grade reading and mathematics 2005*. Retrieved. from [http://nationsreportcard.gov/reading\\_math\\_grade12\\_2005/](http://nationsreportcard.gov/reading_math_grade12_2005/).

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IES National Center for Education Statistics. (2007). *The nation's report card: 12th-grade reading and mathematics 2005*. Retrieved. from [http://nationsreportcard.gov/reading\\_math\\_grade12\\_2005/](http://nationsreportcard.gov/reading_math_grade12_2005/).

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## NAEP Results Reported by the Media.

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The media recently missed another opportunity to shine a spotlight on a counter-stereotypical achievement for women in the sciences.

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Where was the press?

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This media's failing is  
especially troubling today.

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# The “Math Gene”

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Perhaps girls shouldn't even *try* to  
succeed at math.

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*Are Boys Better at Math*

(New York Times)

*The Gender Factor in Math*

(Time )

Math and Sex: Are Girls Born with  
Less Ability

(Science)

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Parents of the gifted boys  
picked up on their sons' talents  
at an early age, bought them  
math books, and talked with  
them about their future careers.

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Ten years after the stories appeared, mothers who were familiar with them lowered their expectations of their daughters' math capabilities.

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Small effects cumulate over time.

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‘I’ll be honest with you. I don’t encourage girls to go into mathematics. They wouldn’t be good at it, and in any case, what would they do with it?’

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## Toy Choice

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On what basis do very young children choose which toys to play with?

### The 3 toys were:

Gun and holster



Traditionally  
male-typed

Tea set



Traditionally  
female-typed

Ball



Traditionally  
neutral

## Purple Rhinestone Gun



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## Spiky Tea Set



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*Spiky tea sets are for boys and purple rhinestone guns are for girls.*



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## Conclusion

Children are **more** likely to base their gender-typing of the objects on the attributes than on their traditional gender-typing.

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## Kitchen Set



## Tool Set



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## Kitchen Set



## Tool Set



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## Boys Playing with the Tool Set

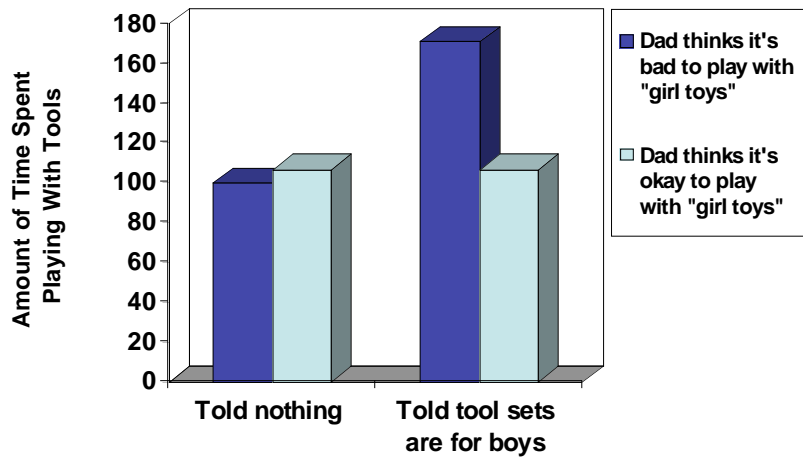


Fig. 1. Mean amount of time boys spent playing with the tool set as a function of their perceptions of fathers' expectations regarding cross-gender-typed play, and toy label condition.

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## Boys Playing with the Kitchen Set

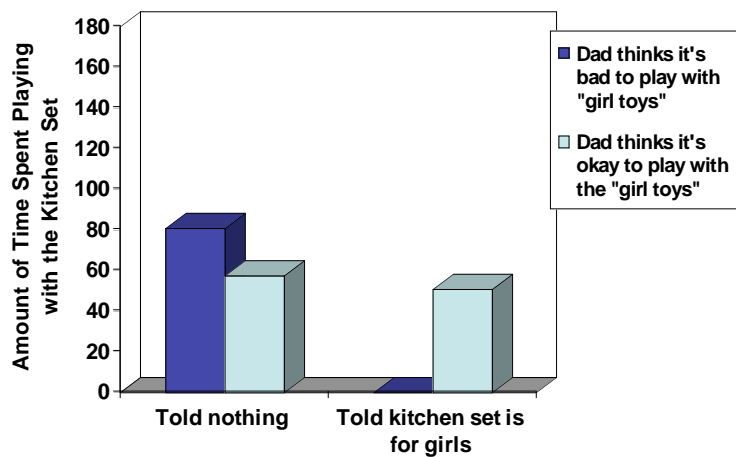


Fig. 1. Mean amount of time boys spent playing with the dish set as a function of their perceptions of fathers' expectations regarding cross-gender-typed play, and toy label condition.

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Parents' gender stereotypes  
are massively reinforced by toy  
marketers and manufacturers.

“Take a field trip to Toys “Я” Us sometime. The gulf between His and Her sides looms like the parted Red Sea, and woe to him who strolls inadvertently into Barbie-land from land of the Action Figures. It's not simply those cute blue and pink blankets anymore; everything is coded”.

(Zimmel, 2003)

For very young boys, the theme is action.

Hot Wheels are prominent as are Matchbox racing cars, and such action figures as Batman.

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For very young girls, not surprisingly, caring and nurturance is foremost.

Dolls of various kinds are dominant, as are fashion toys, doll houses, and kitchen play sets.



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## Polly Wheels



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The toy market for young children portrays a highly gendered world that is out of synch with today's reality.

## Are science toys gendered?







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## What Is To Be Done?

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With greater personal awareness of their own gender stereotypes, early socializers can help stem the pernicious effects of these outmoded cultural beliefs on the self-beliefs of girls and on their eventual math and science choices.

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Once aware of the subtle ways in which their beliefs may color their actions, teachers can begin to monitor their own behavior and begin to make the needed changes.

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Aware parents may begin to question why they behave differently with their daughters and with their sons.

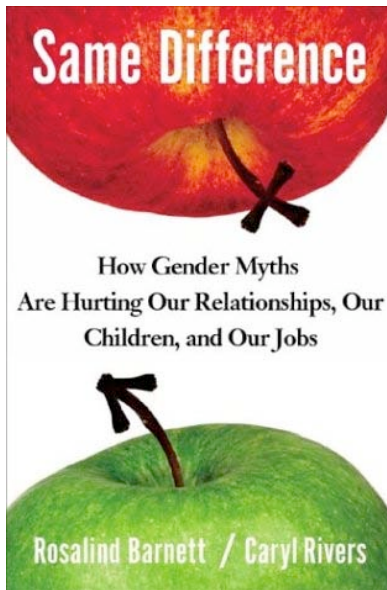
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As the twig is bent  
so grows the tree.

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