

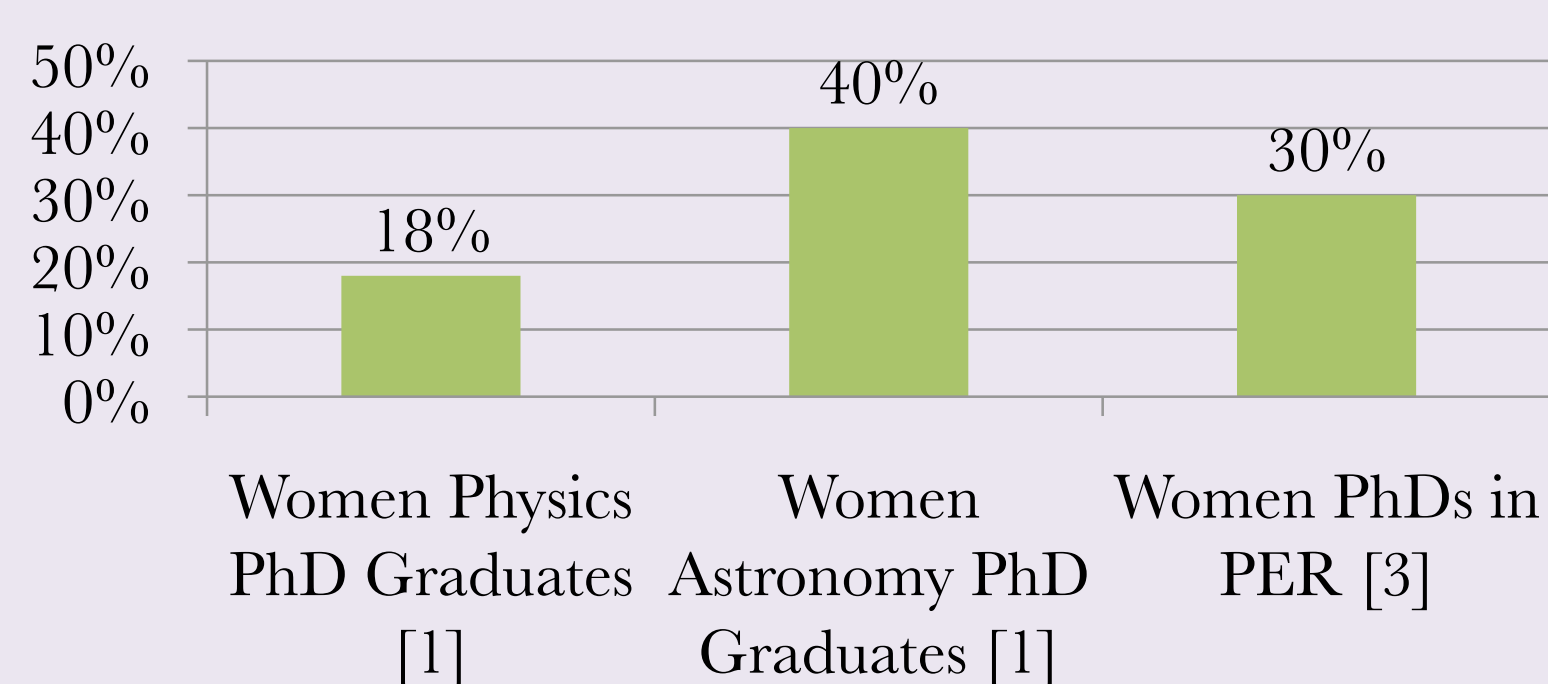
The Graduate Research Field Choice of Women in Academic Physics and Astronomy: A Pilot Study

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Introduction

Women Are More Highly Represented in PER and Astronomy

- Women are underrepresented in physics at every stage of the physics pipeline [1].
- Low percentages are even more startling when considering women comprise 57% of undergraduates [2].
- Women have higher representations in the graduate fields of astronomy and physics education research as compared to physics overall [1,3].



Methods

In-depth Interviews With Women Graduate Student

- Recruited participants at large R1 Universities.
- Participants had to:
 - 1) Gender identify as women
 - 2) Be pursuing a PhD in Physics, Astronomy, or Astrophysics.
 - 3) Have passed their preliminary qualifying examination.
- Used an open ended in-depth interviewing technique to elicit meaningful experiences of participants.
- Used prompts to start interview such as:
 - 1) Tell me about the pathway that brought you to physics.
 - 2) Tell me about your relationship with your advisor.
- Analyzed data through line by line coding, narrative analysis, and cross comparison.
- Looked for emerging theories on graduate research field choice and experiences.

Conclusion

For these women the two most important STV constructs were expectation of enjoyment and long term goals. Cost was not as important because all three had already passed the qualifying exams so they had a reasonable expectation to endure the same cost in any subfield. Attainment value, however, was important for the three because they saw themselves as scientists and wanted to confirm that identity. These women chose their fields based on enjoyment of advisor, research topic, and seeing a clear pathway towards their long term goal of a career. For Grace and Janis this meant a career that was conducive to raising a family. For Stevie, it was a career where she could help people. This illustrates the role of intrinsic value in their graduate research field choice.

Research Questions

I. Why do women choose to study astronomy, physics education research, and physics in graduate level programs?

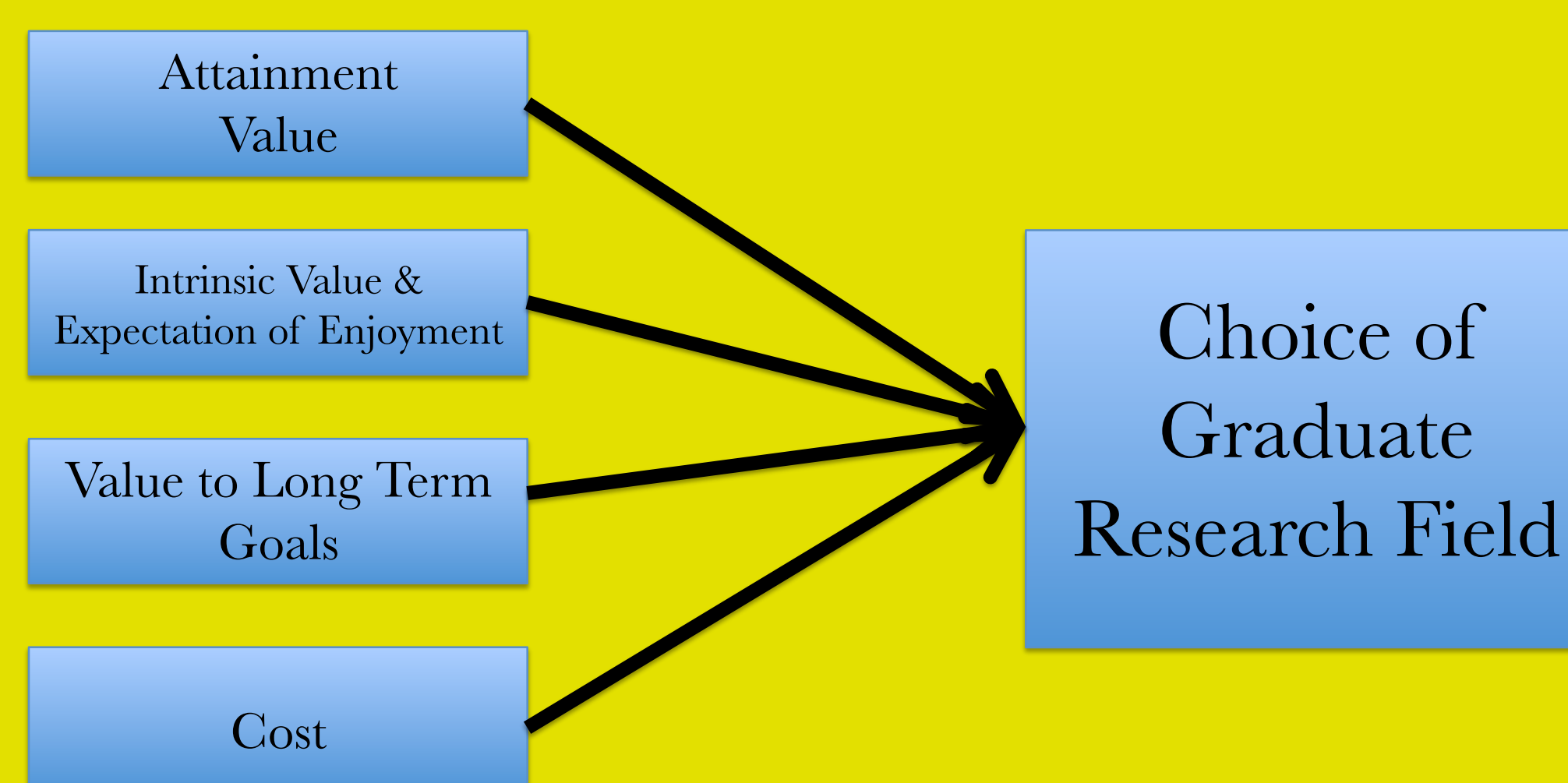
II. What are the experiences of women in astronomy, physics education and physics graduate programs?

Pilot Study Data

Name	Degree Program	Degree Stage
Stevie	Nuclear Physics	Dissertation Defense
Janis	Astronomy	Dissertation Writing
Grace	Physics Education	Dissertation Research

Subjective Task Value

The theoretical framework used to understand the choices of these women was Subjective Task Value (STV) [4]. STV sets out four constructs that are used in the decision making process, these are: attainment value, intrinsic value/expectation of enjoyment, task's relation to long term goals, and cost.



Acknowledgements

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1. AIP Statistical Research Center. www.aip.org/statistics, 2012.
2. U.S. Department of Education. Institute of Education Sciences, National Center for Education Statistics, Table 296, 2012.
3. C.R. Henderson (private communication)
4. J.S. Eccles. Subjective task value and the Eccles et al. model of achievement-related choices. In A. J. Elliot & C. S. Dweck (Eds.), Handbook of competence and motivation (pp. 105-121). New York: Guilford Press

Emerging Themes For Choice

Early Experience and Encouragement

All three participants reported an early and positive exposure to the sciences. Each took AP science courses in high school, while Stevie had a supportive grandfather in her youth, and Grace had a mother that promoted science education in the home. This is what made them choose science at the undergraduate level

Stevie: My grandfather would tell me that, you know, "you gotta use this to do something important, this is a gift [her academic success]".... He encouraged me and thought that that was a good thing, and he tried to push me to do something that made things good... it spoke to me.

Camaraderie

Fellow classmates were a significant source of help at some point in these participant's graduate careers. For Grace and Janis it was in the course work grinding out problems and studying for the qualifying examinations. For Stevie, it was advice and guidance while she was trying to find a new advisor, and a concerned colleague telling her to avoid a sexist lab member.

Grace: ...we kind of all hunkered down and did our homework together and so, especially in the first year. The group of first years, we were all in the same hallway actually, we all had offices in the same hallway and so there were like 40 of us working on the same homework, the same problem sets. So we were very close, and actually we still are quite close from that and from studying for the quals. That like, suffering together experience makes it so that you can still be friends after...

Advisor Support

Supportive advisors were key for the success of these three women. Each participant was finishing their PhD with a different advisor than they started. Grace ended in a different subfield and Stevie in a different topic. All three changed advisors to find a personality and research setting conducive to their enjoyment and success.

Janis: He's [advisor] absolutely amazing, he has energy, I don't know where it comes from especially with a kid at home [laughs]. But, he's always giving me information about networking, and careers and various project ideas. We do computational physics.

Outreach & Career in Education

The three women in the pilot study all participated in outreach with young students at different points in their careers. Janis worked on teaching elementary students astronomy while Stevie taught them about nuclear fission. Grace worked in a science museum where she showed kids basics physics and biology experiments. Two of the three, Grace and Janis, eventually want careers doing outreach, trying to support science education in young students.

Stevie: I also really care about the fact that I have been able to do some outreach. Where I get to work with little kids and try to explain to them all those things I wish I had known. You know, be like, look I'm a scientist and you can be a scientist too. Here's kind of, the third grader explanation of what kind of science I do. Show them fun demonstrations, because that's what I cared about when I was a little kid... smashing things in liquid nitrogen. Um, and that's been really rewarding.

Future Family

Two of the three participants, Grace and Janis, voiced concern over balancing a career at a R1 university and a family. Both felt the perceived stress and pressure at R1 universities was too much and would not allow them to have hobbies and a family. They preferred to seek employment in professional outreach or a teaching intensive college.

Grace: There's a lot of pressure to perform. There's that whole getting tenure thing. And like, it's very cliché, but it's like... I'd like to have a family some day and I have other things I like to do and I want to have time for that.