

# Bias in peer recognition does not explain differences in how men and women perceive their recognition in physics courses

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**Abstract.** Gaining recognition as a physics person from peers is an important contributor to undergraduate students' persistence in physics courses. Previous research has separately demonstrated that women perceive less peer recognition than men (perceived recognition) and that women receive fewer nominations from their peers as strong physics students than men (received recognition). The relationship between perceived and received peer recognition, however, is not well understood. Here we present a large-scale study of over 1,600 introductory physics students at several US institutions. Results show that, for students receiving the same amount of recognition, women report significantly lower perceived recognition than men.

## Introduction

Women face many barriers to entry and retention in physics [1,2]. One significant challenge is that women may both *perceive* and *receive* less recognition from their peers about their abilities as physicists than men [2,3]. Such recognition from peers directly correlates with students' *physics identity*—the extent to which they view themselves as a physics person—and, in turn, their persistence in science courses and careers [1].

These previous findings suggest a few possible relationships between students' gender, perceived recognition, and received recognition, each with different implications for mitigating recognition gaps. It could be that both men and women internalize their peer recognition similarly and that men only perceive more peer recognition than women because they receive more peer recognition than women. This relationship would imply that instructors should target received recognition, for example by refining students' criteria through which they recognize their peers. Alternatively, men and women may internalize their peer recognition differently, such that men only perceive more peer recognition than women because they have higher perceptions of their recognition than women receiving the same amount of recognition. This relationship would imply that instructors should target perceived recognition to ensure that all students appropriately internalize recognition from peers. We designed a study to directly test these possible relationships.

## Methods

We collected data from 1,688 introductory physics students at eight different institutions in the United States via an online survey, using existing measures of perceived [2] and received [3] peer recognition. The perceived recognition item asked students the extent to which they agreed with the statement “My peers see me as a physics person” on a 5-point Likert scale. The received recognition item asked students to nominate peers who they felt were “particularly strong” in their physics course, through which we determined the number of nominations received by each student. We asked these questions separately for the instructional contexts of laboratory (lab) and lecture.

We fit a linear mixed model for each instructional context (lab and lecture) with perceived recognition as the dependent variable. The model included predictor variables for gender, received recognition, and the interaction between gender and received recognition, as well as other student demographics (academic year, major, and race or ethnicity) and course as a random intercept.

Table 1. Coefficient estimates and standard errors for relevant variables of the linear mixed models (\*\* $p < 0.01$ ; \*\*\* $p < 0.001$ ). The reference group for gender is men, thus the coefficients shown are for women relative to men.

	Lab	Lecture
Woman	-0.238*** (0.060)	-0.300*** (0.075)
Received recognition	0.074** (0.033)	0.110*** (0.031)
Woman*Received recognition	-0.012 (0.044)	-0.014 (0.060)

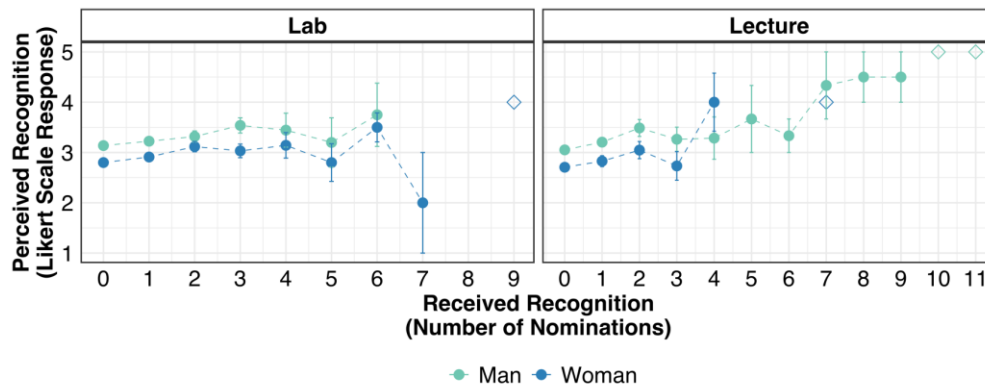


Fig. 1. Line plots comparing mean perceived recognition (5 indicates “strongly agree” and 1 indicates “strongly disagree”) at each level of received recognition, split by student gender and instructional context. Error bars represent the standard uncertainty in the mean. Unfilled diamonds represent individual students.

## Findings

In both lab and lecture, the results showed that, for students receiving the same amount of peer recognition (and having the same academic year, major, and race or ethnicity), women reported significantly lower perceived recognition than men (Table 1 and Figure 1). Received recognition also separately predicted perceived recognition: students receiving more recognition reported significantly higher perceptions of their recognition. The difference between men’s and women’s perceived recognition did not vary for different amounts of received recognition as indicated by the interaction term.

## Conclusion

Our findings indicate that students’ varying internalization of their peer recognition better explains differences in men’s and women’s perceptions of their peer recognition than gender biases in received peer recognition. In contrast to existing recommendations [4], these results suggest that a meaningful intervention should target perceived peer recognition, such that all students appropriately internalize recognition from their peers.

## References

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