



Feedback hinders performance on women's mathematics problem solving

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Focus

1. Does feedback facilitate learning during mathematics problem solving?
2. Does the context in which feedback is provided influence interpretations of said feedback?

Background

The effects of feedback vary and are not universally beneficial (Mory, 2004). In fact, feedback can hinder learning relative to no feedback (Fyfe & Brown, 2018).

One theory suggests feedback is more likely to have negative effects when it draws attention to one's self and abilities rather than to the task (Kluger & DeNisi, 1996).

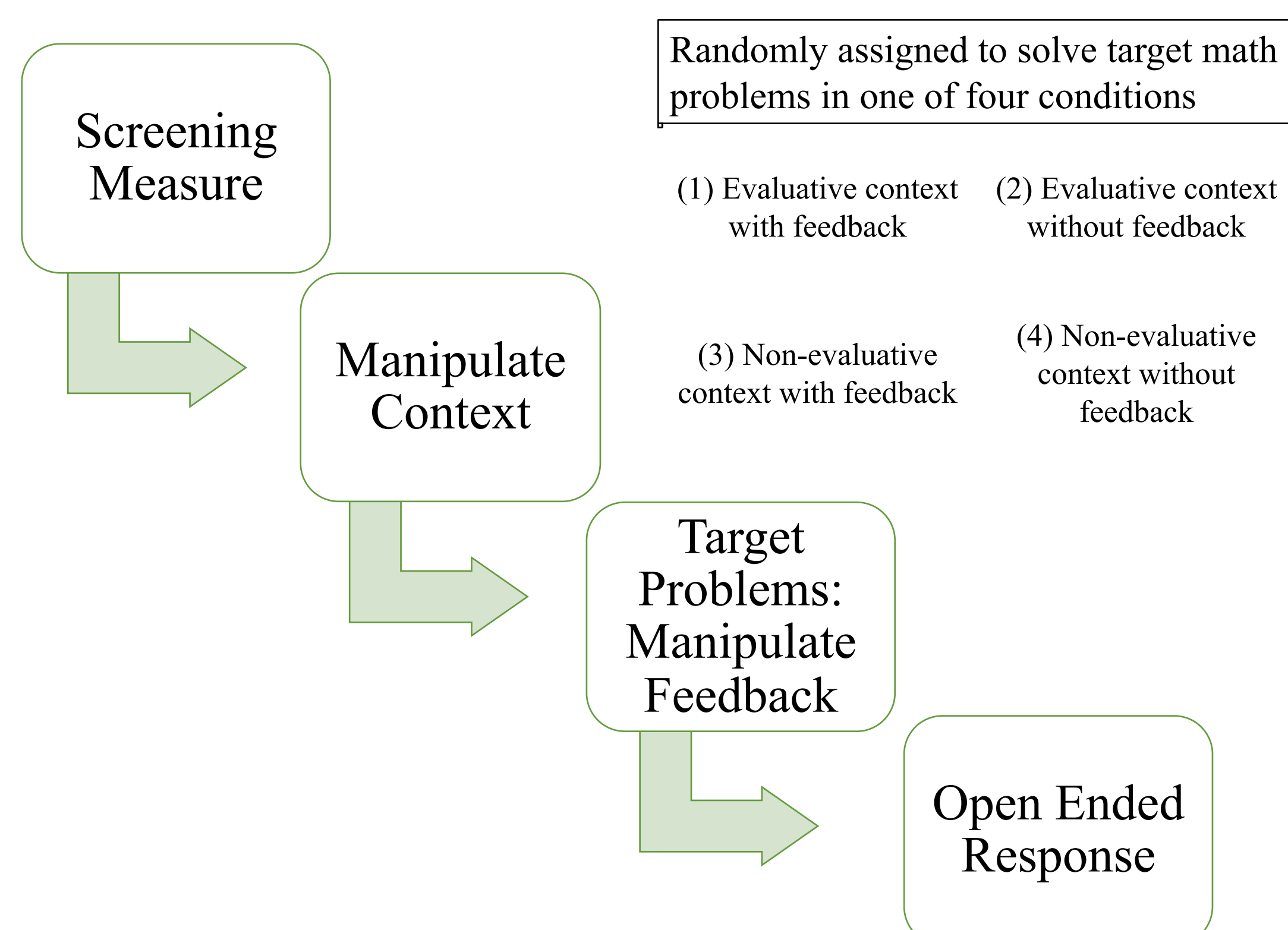
Thus, we hypothesize that feedback may be less effective when provided in an evaluative context. This may be particularly true for women, who are subject to experiencing stereotype threat and thinking about their self and abilities in math (Rydell & Boucher, 2017).

Method

PARTICIPANTS

87 undergraduate students enrolled in an introductory psychology course at Indiana University-Bloomington (M age = 19.2 years; 57 females, 30 males).

DESIGN AND PROCEDURE



Conditions

Table 1. Students assigned to one of four conditions.

Condition	Context	Feedback
Evaluative	The purpose of this study is to evaluate your ability to solve these kinds of math problems correctly...	Yes The response provided is correct/incorrect. The correct response is 0.8. Remember to focus on getting the right answers.
		No The response has been recorded. Remember to focus on getting the right answers.
Non-evaluative	The purpose of this study is to expose you to important math problems...	Yes The response provided is correct/incorrect. The correct response is 0.8. Remember to focus on learning.
		No The response has been recorded. Remember to focus on learning.

Figure 1. Target problem.

Problem Scenario
Imagine you work in a police department. Your department often uses Breathalyzers to test whether drivers are driving under the influence of alcohol. Based on previous cases in which a person's sobriety was later verified, you know the following:

	Positive Breathalyzer Test (Indicates drunkenness)	Negative Breathalyzer Test (Does not indicate drunkenness)
Sober Driver	A 150	B 750
Drunk Driver	C 75	D 25

Prevalence Problem
1. Based on this table, how likely is it that a driver is drunk?
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
Slide the bar along the scale to select an answer. The slider is sensitive to minor movements, so be careful with your selection.

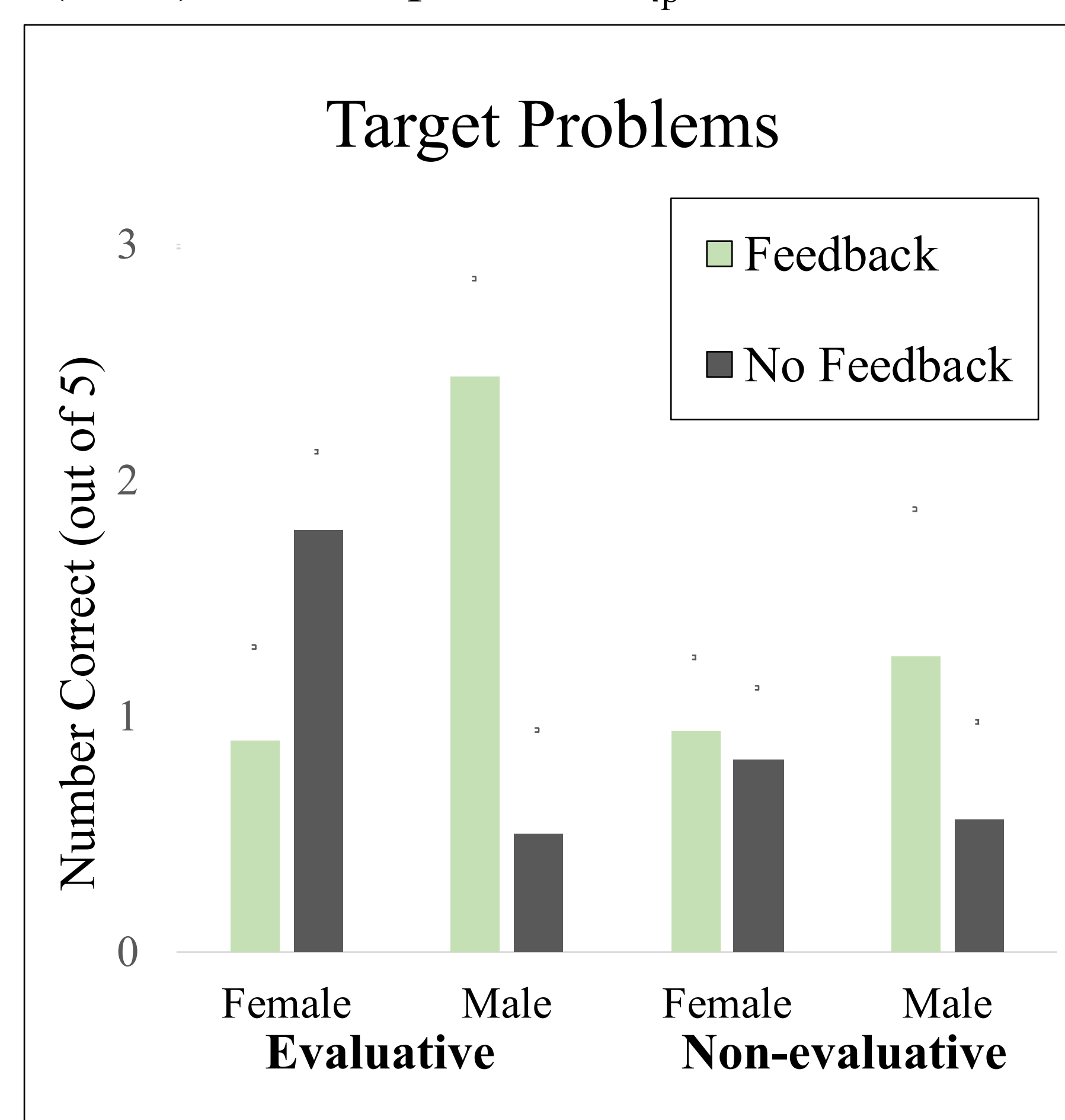
Predictive Value Problem
2. Based on this table, how likely is it that a driver with a positive Breathalyzer test is actually drunk?
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
Slide the bar along the scale to select an answer. The slider is sensitive to minor movements, so be careful with your selection.

Results

Target Probability Problems

In *non-evaluative* context: no effects of feedback, gender, or their interaction, $F_s < 2$.

In *evaluative* context: no main effects, but a significant feedback by gender interaction, $F(1, 37) = 10.17, p = .003, \eta_p^2 = .22$.



Open Ended Responses

Females were significantly more likely to report feelings of stress (64%) relative to males (38%), $\chi^2(1, N = 66) = 4.42, p = .04$.

Example Responses Reporting "Stress"

"I felt anxious because math is not my strongest subject."

"I felt very inadequate while solving this problems. I thought I would know more!"

"I was very confused, the math was harder than expected."

Example Responses Reporting "Non-Stress"

"They were relatively easy and quick."

"I felt pretty good. The more problems I did, the better I got!"

"I felt like I was capable of solving every problem as long as I had enough time."

Conclusions

Feedback influenced problem-solving performance, but it depended on both *context* and *gender*.

In the non-evaluative context, there were minimal effects of feedback and gender. However, in the evaluative context, feedback had positive effects on performance for men, but negative effects on performance for women.

Women were more likely to experience stress during the task compared to men, though this did not differ by context or whether feedback was provided.

Implications

Feedback that is provided in an evaluative context may draw attention to the learners' self-image and abilities. For some learners, this may consume cognitive resources that are necessary to perform a task and/or may produce affective reactions that interfere with performance (e.g. Kluger & DeNisi, 1998).

Specifically, women operating in an evaluative, threat-like condition may be more likely to interpret feedback in ways that negatively effect learning and performance (Mangels et al., 2011).

Even if feedback is corrective and informative, it may have consequences for mathematics performance.

References & Contact

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