



The Distraction-Error Model: A Simplified Account of The Effects of Prohibition on Motor Control

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Abstract

Prohibition in instruction is commonplace in performance-oriented motor tasks, providing a simple and intuitive method for shaping behavior. Previous research warns against the use of prohibition, particularly for gender-biased tasks. In contrast with Wegner and colleagues' (1998) ironic process theory of motor control and de la Peña's (2008) implicit overcompensation hypothesis, we offer a distraction-error model that suggests attentional disruption following prohibitive instruction. As we demonstrate across three separate motor tasks, prohibitive instruction results in a dramatic initial increase in error followed by attenuation toward the target level of performance, whereas no increase in error is observed in the absence of prohibition. Assessment of this hypothesis across neutral, male- and female-stereotyped tasks suggests comparable patterns of error, supporting the parsimonious distraction-error model. Thus, prohibitive instruction may induce temporary and preliminary increases in error, but performance ultimately improves over time.

Background

- Wegner's Ironic Process Theory argues that prohibitive instruction leads to an increased likelihood of enacting the prohibited behavior.¹
 - Originally pertaining to mental control, Wegner extended this theory to encompass motor control.²
 - Under memory load, more ironic motor behavior is observed with prohibitive instruction than without.²
- In contrast, the Implicit Overcompensation Hypothesis argues that overcompensation errors are more likely than ironic errors in motor tasks.³
 - Prohibition primes the opposite of a target behavior, which requires a compensatory process to override it.
 - Activation of the compensatory process leads to overcompensatory errors.
- We present a simplified Distraction-Error Model for responses to prohibitive instruction.
 - Prohibitive instruction causes distraction, which moves focus away from the task, resulting in error.
 - The initial direction of the error (Ironic or Overcompensatory) is arbitrary.
 - The magnitude of these errors attenuates over time.

Questions & Predictions

Does prohibitive instruction cause an increase in error?

Prohibition causes distraction, which results in increased errors immediately following prohibition.

Are ironic errors more common than overcompensatory errors following prohibitive instruction?

Overcompensatory errors are most common following prohibitive instruction, although ironic errors may occur periodically.

Do errors resulting from prohibition diminish over time?

Over time, the magnitude of errors due to prohibitive instruction should attenuate, and performance should return to pre-prohibition levels.

Do gendered stereotypes influence the prevalence of ironic errors?

Men and women should exhibit ironic errors with equal prevalence.

References & Acknowledgments

- Wegner, D. M. (1994). Ironic processes of mental control. *Psychological Review*, 101(1), 34.
 - Wegner, D. M., Ansfield, M., & Pilloff, D. (1998). The putt and the pendulum: Ironic effects of the mental control of action. *Psychological Science*, 9(3), 196-199.
 - de la Peña, D., Murray, N. P., & Janelle, C. M. (2008). Implicit overcompensation: The influence of negative self-instructions on performance of a self-paced motor task. *Journal of Sports Sciences*, 26(12), 1323-1331.
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Method

All three tasks followed the same general procedure, shown below.

- Participants in control conditions did not receive a prohibition
- Task order and prohibition were counterbalanced between participants

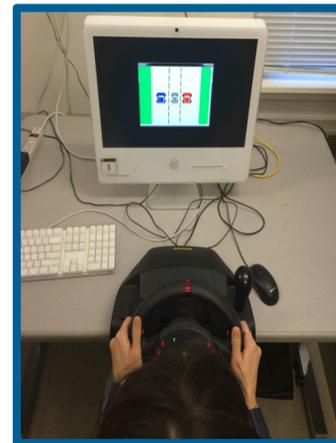


Golf Task



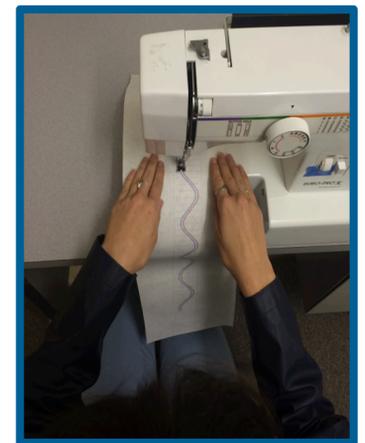
Instruction: "Hit the ball inside rectangular target."
Prohibition: "Be particularly careful not to [OVER|UNDER]shoot."

Driving Task



Instruction: "Keep the gray car between the others."
Prohibition: "Be particularly careful not to hit the [RED|BLUE] car."

Sewing Task

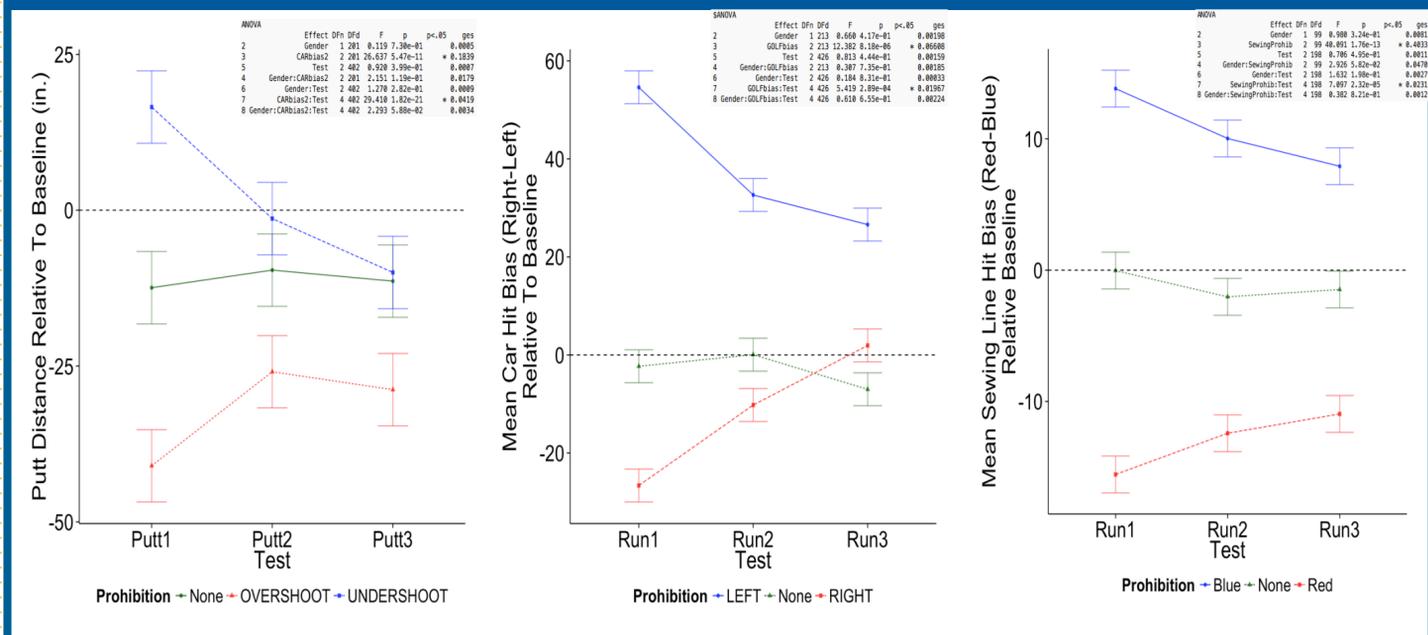


Instruction: "Keep the pen between the two lines."
Prohibition: "Be particularly careful not to cross the [RED|BLUE] line."

Performance was measured for the baseline trial and each of the three test trials.

Error measures were calculated as the difference between the test trial performance and the baseline values.

Results: Prohibition Causes an Increase in Error That Attenuates Over Time



Summary

Does prohibitive instruction cause an increase in error?

YES. Prohibitive instruction can be distracting, and thus results in increased error immediately following prohibition.

Are ironic errors more common than overcompensatory errors following prohibitive instruction?

NO. Overcompensatory errors are both more common and are greater in magnitude than ironic errors following prohibition.

Do errors resulting from prohibition diminish over time?

YES. Errors attenuate over the course of three trials, suggesting that prohibition is initially distracting but wanes over time.

Do gendered stereotypes influence the prevalence of ironic errors?

NO. Men and women perform comparably on neutral, male-stereotyped and female-stereotyped tasks.

Conclusions

By addressing major experimental biases in earlier investigations of prohibition and motor control, we provide strong evidence for a new approach to the relationship between prohibition and errors in performance.

Some form of error occurs immediately following prohibition. The direction of this error is not affected by any known factor.

In cases where behavior is not prohibited, no meaningful change in error is observed relative to baseline.

These errors attenuate quickly and dramatically in subsequent trials.

Contrary to previous findings, ironic and overcompensatory effects do not differ across genders.

In contrast with Ironic Process Theory and the Implicit Overcompensation Hypothesis, these results support a more general Distraction-Error Model of the effects of prohibition on motor control.