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The Effects of Loss Aversion Framing on High School Test Performance: A Pilot Study

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ABSTRACT

This pilot study examined whether loss aversion, a core principle in behavioral economics, affected academic performance when applied to everyday classroom assessments. Across three AP Macroeconomics class periods (N = 36), students had been randomly assigned to take identical quizzes that differed only in scoring format. One version framed performance as points lost, beginning at 100 points with deductions for incorrect answers. The other framed performance as points earned, beginning at zero and adding points for correct answers. Students in the loss-framed condition scored significantly higher (M = 12.6 out of 15) than those in the gain-framed condition (M = 11.4 out of 15). An independent sample t-test indicated statistical significance (p = 0.045), and Cohen's d = 0.63 indicated a medium-to-large effect size. Survey responses suggested that most students believed the framing did not influence them. Given institutional constraints preventing baseline balance verification and immediate replication, the findings should be interpreted as preliminary pilot evidence consistent with a framing effect rather than definitive causal proof.

INTRODUCTION

Behavioral economics has consistently demonstrated that decision-making is shaped not only by objective outcomes but also by the manner in which those outcomes are presented. Among the most robust findings is loss aversion, the tendency for individuals to experience losses more intensely than equivalent gains (Kahneman & Tversky, 1979). Prospect theory predicts that the value function is steeper in the domain of losses than gains, implying that avoiding losses may generate stronger motivational responses than acquiring equivalent rewards.

This asymmetry has been observed across consumer behavior, insurance uptake, investment decisions, and health compliance (Rabin, 2000; Thaler, 1980; Barberis, 2013). Individuals frequently exhibit greater willingness to act in order to avoid losses than to pursue gains of equal magnitude (Tversky & Kahneman, 1991). The endowment effect further reinforces this principle, demonstrating that individuals assign greater value to outcomes they already possess relative to identical outcomes not yet obtained (Kahneman, Knetsch, & Thaler, 1990).

Despite this extensive foundation, comparatively less research has examined whether loss aversion may influence everyday academic environments. Classroom assessments are typically framed as points earned or grades achieved, emphasizing accumulation. Reframing identical assessment outcomes as points lost establishes a different psychological reference point: rather than building upward from zero, students begin with full allocation and risk losing value.

This pilot study investigated whether quiz scores presented as points lost were associated with higher performance compared to scores framed as points earned. By situating this question at the intersection of education and behavioral economics, the study evaluated whether minor linguistic variations in feedback may correspond with measurable differences in attentiveness and accuracy.

While prior educational applications of prospect theory have largely focused on financial incentives, such approaches may not reflect the conditions under which most students encounter feedback. Monetary incentives are relatively uncommon in everyday classroom environments and often require additional resources to implement. In contrast, grading language is present in virtually every educational setting and can be modified without financial cost.

By examining whether framing identical assessment outcomes as points lost rather than points earned influences performance, this study extends existing behavioral economics research into a more routine educational context. This focus allows for the evaluation of prospect theory under conditions that more closely resemble everyday classroom experiences. As a result, the study contributes preliminary evidence regarding whether subtle linguistic changes in assessment design may be associated with measurable differences in student outcomes.

THEORY & HYPOTHESIS

By examining whether framing identical assessment outcomes as points lost rather than points earned influences performance, this study extends existing behavioral economics research into a more routine educational context. This focus allows for the evaluation of prospect theory under conditions that more closely resemble everyday classroom experiences. As a result, the study contributes preliminary evidence regarding whether subtle linguistic changes in assessment design may be associated with measurable differences in student outcomes.

The theoretical foundation of this study lies in prospect theory (Kahneman & Tversky, 1979), which posits that individuals evaluate outcomes relative to a reference point rather than in absolute terms. A central tenet of the theory is loss aversion: losses generate greater psychological impact than equivalent gains. Experimental evidence consistently demonstrates steeper sensitivity to negative deviations below a reference point than to positive deviations above it (Camerer, 2005; Tversky & Kahneman, 1991).

Prior research has extended framing principles into educational contexts. Fryer et al. (2012) demonstrated that teachers receiving loss-framed financial incentives outperformed those receiving gain-framed incentives. Levitt, List, and Sadoff (2016) similarly reported that student incentives framed as potential

losses were more effective than equivalent gain frames. However, much of this literature has focused on monetary incentives rather than everyday grading language.

The present study addressed this gap by testing whether reframing quiz outcomes as points lost rather than points earned corresponded with measurable differences in performance.

Research Question

Does framing quiz performance in terms of points lost rather than points earned correspond with differences in student quiz outcomes?

Null Hypothesis (H_0): Framing quiz performance as points lost will have no significant effect on quiz outcomes compared to framing as points earned.

Alternative Hypothesis (H_a): Students who receive points-lost framing will achieve significantly higher quiz scores than those who receive points-earned framing.

The hypothesis is derived from prospect theory's prediction that losses are psychologically more salient than equivalent gains. However, because the present design does not directly measure perceived loss sensitivity, anxiety, or risk preferences, it cannot conclusively establish loss aversion as the operative psychological mechanism.

METHODOLOGY OVERVIEW

The study had been conducted across three AP Macroeconomics class periods over two consecutive school days. Each class period completed the same 15-question multiple-choice quiz covering Unit 1 content.

Students had been randomly assigned to two framing conditions through blind distribution from a fully shuffled mixed stack of quizzes:

• Version A (loss framing): quiz began at 100 points with deductions per incorrect response

• Version B (gain framing): quiz began at 0 points with additions per correct response

Quizzes had been placed face down and distributed sequentially from the shuffled pile. Students were instructed not to turn over tests until timing began.

Following completion, students completed a brief post-test questionnaire assessing awareness of scoring format and perceived influence.

INSTITUTIONAL CONSTRAINTS

Under Chicago Public Schools student privacy regulations, access to individual historical academic performance data (e.g., GPA, prior quiz averages) requires formal district-level authorization. Such authorization was not available for this study; therefore, pre-treatment academic equivalence between groups could not be empirically verified.

Additionally, Chicago Public Schools assessment policies prohibit re-administering the identical graded assessment within the same term for research purposes. As a result, immediate within-semester replication of the same assessment was not feasible.

ASSUMPTIONS

Several assumptions underlie the interpretation of results:

1. Randomization Assumption: Assignment had been independent of baseline academic ability. Although blind shuffling had been implemented, baseline equivalence could not be empirically verified due to institutional data access restrictions.
2. No Spillover Assumption: Students had not shared content during testing. Survey responses indicated no reported discussion.
3. Measurement Assumption: Quiz scores reflected attentiveness and effort rather than chance variation alone.
4. Stable Environment Assumption: Testing conditions had been comparable across periods. No significant period-by-treatment interaction was detected.

If baseline academic ability differed across groups despite randomization, observed differences could partially reflect pre-existing variation rather than framing alone.

RESULTS

Version A (Points Lost):

Mean = 12.6/15 (84%), SD = 1.3

Version B (Points Gained):

Mean = 11.4/15 (76%), SD = 1.7

An independent samples t-test yielded:

$t(34) = 2.09$

$p = 0.045$

Students in the loss-framed condition scored approximately 8 percentage points higher.

Cohen's $d = 0.63$ (medium-to-large effect).

The 95% confidence interval for the mean difference ranged from 0.17 to 2.19 points. The data are consistent with a true mean difference within this interval; however, this interval should not be interpreted as a 95% probability statement about the true parameter.

No significant period-by-treatment interaction was observed:

$F(2,33) = 0.42$, $p > 0.65$

Table 1. Descriptive statistics by treatment condition

Statistic	**Loss-Framed (n = 18)**	**Gain-Framed (n = 18)**
Mean Score (out of 15)	12.6	11.4
Mean Percentage	84%	76%
Standard Deviation	1.3	1.7
Standard Error	0.31	0.40
Cohen's d	0.63	—
t-statistic	t(34) = 2.09	—

p-value	0.045	—
95% Confidence Interval	[0.17, 2.19]	—

Questionnaire Results

72.2% reported that scoring format did not affect their approach.

19.4% reported working carefully to avoid losing points.

19.4% reported trying to gain as many points as possible.

100% reported no discussion during testing.

91.7% reported no effect from noticing other versions.

Figure 1 displays participant responses regarding the perceived effect of the scoring format. Most students (72.2%) reported that the scoring method did not affect their approach, while smaller percentages reported actively attempting to avoid losing points or maximize points gained. A bar chart summarizing these responses is included as Figure 1.

DISCUSSION & INTERPRETATION

The results are consistent with prospect theory's prediction that framing outcomes as potential losses may heighten vigilance and attentiveness. Establishing 100 points as a reference point may increase the psychological salience of errors, thereby encouraging greater double-checking or cautious reasoning.

However, the present design does not isolate the underlying psychological mechanism. Heightened performance under loss framing may reflect reference-dependent loss sensitivity, increased cognitive arousal consistent with the Yerkes-Dodson effect, or other attentional processes. Because perceived loss, anxiety levels, and individual loss-aversion parameters were not directly measured, mechanism inference remains speculative.

Furthermore, given the modest sample size (N = 36) and a p-value near 0.05, the estimate is statistically fragile and sensitive to sampling variability. The results therefore constitute preliminary pilot evidence of a framing effect under specific classroom conditions rather than definitive proof of loss aversion.

EDUCATIONAL SIGNIFICANCE

This pilot study contributes to an emerging intersection between behavioral economics and classroom assessment practices by isolating linguistic framing absent monetary incentives. While large-scale studies have demonstrated loss-framed financial incentives in education, fewer investigations have examined everyday grading languages as a behavioral intervention.

If replicated across additional cohorts and contexts, such findings may suggest that subtle shifts in feedback structure could serve as low-cost educational interventions. However, broader generalization requires replication and stronger internal validity verification.

LIMITATIONS & FUTURE DIRECTIONS

The sample size (N = 36) limits statistical power and generalizability. A formal balance check using prior academic performance had not been possible due to Chicago Public Schools student record access restrictions. Consequently, baseline imbalance between groups cannot be ruled out.

Institutional assessment policies prevented immediate replication of the same graded assessment within the same semester. Therefore, robustness across cohorts has not yet been established.

Future research should incorporate:

- Pre-treatment academic measures for balance testing
- Direct measures of loss aversion (e.g., mixed gamble tasks)
- State anxiety scales to distinguish arousal mechanisms
- Multiple replications across independent samples

CONCLUSION

This pilot study found that students receiving points-lost framing scored higher than those receiving points-earned framing on an identical assessment. While the findings are consistent with predictions derived from loss aversion theory, the absence of balance verification, mechanism measurement, and replication limits causal inference.

The results should therefore be interpreted as preliminary evidence that framing may correspond with differences in classroom performance. Further replication and mechanism testing are required before definitive conclusions can be drawn.

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APPENDICES

Appendix A. Loss-Framed Quiz (Starts at 100)

Research study consent (please read):

This test is part of a high-school research study. By turning in this test you are consenting to have your anonymized scores used for research. If you have questions about the study, contact Maya Clark: mclark57@cps.edu.

Scoring: Start at 100 points. Each incorrect or blank answer subtracts 5 points. Max = 100, Min = 0.

Multiple Choice (Circle the best answer)

1. Economics is primarily concerned with:

   A. Eliminating scarcity B. Allocating limited resources to satisfy unlimited wants C. Increasing government regulation D. Studying money and banking

2. The fundamental problem of economics is:

   A. Inflation B. Scarcity C. Unemployment D. Trade deficits

3. The opportunity cost of a choice is:

   A. The money spent on it B. The next best alternative foregone C. The total benefit gained D. The amount of time invested

4. A point inside the production possibilities curve (PPC) represents:

   A. Full employment of resources B. Inefficient use of resources C. Unattainable output D. Maximum efficiency

5. If country A can produce more of a good using the same resources than country B, country A has:

   A. Comparative advantage B. Absolute advantage C. Increasing opportunity costs D. Specialization

6. Comparative advantage is based on:

   A. Lower absolute costs B. Lower opportunity costs C. Higher productivity D. More

resources

7. Specialization and trade benefit both parties when:

   A. One country has absolute advantage in all goods B. Opportunity costs differ between countries C. Both countries are equally efficient D. Resources are perfectly mobile

8. Which of the following is a normative economic statement?

   A. "Unemployment is currently at 4%." B. "Government spending increased by 10% last year." C. "The government should reduce income inequality." D. "Exports rose faster than imports in 2023."

9. A mixed economy is best described as:

   A. Completely free-market B. Completely government-controlled C. A combination of market forces and government involvement D. Traditional barter-based system

10. Which of the following is NOT one of the basic economic questions?

    A. What goods and services will be produced? B. How will they be produced? C. Who will consume them? D. How much money should be printed?

11. On a bowed-out PPC, the increasing slope reflects:

    A. Constant opportunity cost B. Decreasing opportunity cost C. Increasing opportunity cost D. No opportunity cost

12. If the PPC shifts outward, it means:

    A. A decrease in available resources B. Economic growth C. Increased inefficiency D. A fall in opportunity costs

13. The law of increasing opportunity cost exists because:

    A. Resources are equally efficient in all uses B. Resources are specialized C. Technology always improves D. Markets do not exist

14. In command economies, decisions about production and distribution are made by:

    A. Households B. Firms C. The government D. Markets

15. Which of the following is an example of capital?

    A. A factory machine B. Natural resources C. Labor skills D. Government regulation

Appendix B. Gain-Framed Quiz (Starts at 0)

Research study consent (please read):

This test is part of a high-school research study. By turning in this test you are consenting to have your anonymized scores used for research. If you have questions about the study, contact Maya Clark: mclark57@cps.edu.

Scoring: Start at 0 points. Each correct answer adds 5 points. Max = 100.

Multiple Choice (Circle the best answer)

1. Economics deals mainly with:

   A. Scarcity and choice B. Eliminating inflation C. Balancing the federal budget D. Stock market performance

2. Scarcity means that:

   A. Goods are always expensive B. Human wants exceed the resources available C. Markets are not competitive D. People cannot make choices

3. The opportunity cost of attending college full time is:

   A. The cost of tuition B. The forgone wages from not working C. Books and supplies D. Room and board

4. Points inside the PPC are:

   A. Efficient and attainable B. Inefficient but attainable C. Efficient but unattainable D. Impossible to reach

5. If Country X produces both goods more efficiently than Country Y, it has:

   A. Comparative advantage B. Absolute advantage C. No advantage in trade D. Allocative

efficiency

6. A nation should specialize in the good for which it has:

   A. Absolute advantage B. Comparative advantage C. Lower wages D. More natural resources

7. Gains from trade exist because:

   A. Countries have identical opportunity costs B. Nations differ in opportunity costs and specialize C. One country dominates production D. Scarcity does not apply internationally

8. Which is a normative economic statement?

   A. "GDP grew by 3% in 2024." B. "Inflation averaged 2% this year." C. "The government should raise the minimum wage." D. "Exports increased in the last quarter."

9. In a mixed economy:

   A. Government is completely absent B. Government controls all decisions C. Both markets and government play a role D. All trade is done through barter

10. Which is NOT a key economic question?

    A. What to produce? B. How to produce? C. Who gets the goods? D. How should profits be taxed?

11. The concept of increasing opportunity cost is shown by:

    A. A bowed-out PPC B. A straight-line PPC C. A point outside the PPC D. A perfectly efficient PPC

12. An outward PPC shift may result from:

    A. War destroying capital B. A new technology improving efficiency C. Population decline D. Reduction in investment

13. The law of increasing opportunity cost arises because:

    A. All resources are identical B. Some resources are better suited to certain tasks than others C. Resources are unlimited D. People always prefer variety

14. In a market economy, what guides production decisions?

    A. Consumer demand and price signals B. Government quotas C. Historical tradition D. Central planning

15. Which is an example of physical capital?

    A. A farmer's tractor B. Corn seed C. Farm labor D. Fertile land