Loss Aversion and Risk for Cigarette Smoking and Substance Abuse

Eric A. Thrailkill[1,2,3], Michael DeSarno[1,4], and Stephen T. Higgins[1,2,3]
[1]Vermont Center on Behavior and Health, [2]Departments of Psychological Science, [3]Psychiatry, and [4]Biomedical Statistics

Background

• Behavioral Economics has identified systematic biases in decision making.

• Losses loom larger than gains (Kahneman & Tversky, 1979).

• Might be related to risky and/or unhealthy behavior (e.g., substance use despite negative consequences).

• Is Loss Aversion a protective factor?

• Addiction involves considerable loss of opportunity, money, relationships, etc.

• Low Loss Aversion has been found in SUD, but studies did not control for other decision-making (i.e., Delay Discounting), or SUD risk (smoking), or sociodemographic (age, gender, education) factors.

• This experiment addressed the following:

1. Are cigarette smokers less loss averse than nonsmokers?

2. Does Loss Aversion predict smoking?

3. Does Loss Aversion predict other substance use (alcohol, other drugs) and other behavioral health problems (sleep disturbance, depressed mood)?

Method

Design
• Adult (18-55) daily cigarette smokers (>10 per day) and adult never-smokers (<100 lifetime) from Mechanical Turk.

Measures
• General health items, Loss Aversion (coin flips; 2:1 Gain-loss), Delay Discounting (control).
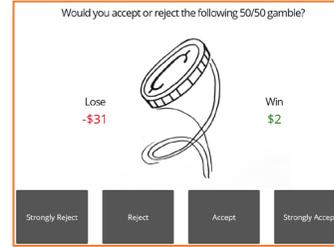
Outcomes
• Smoking status, other substance use (alcohol, drugs), other behavioral health (sleep disturbance, depressed mood)
• Proportion "accept" choices (.5 = Loss Aversion)
• Discount rate (ln k)

Results

Sample Characteristics

Group	Smokers	Never-smokers
n	181	237
Age (M ± SD)	37.39 ± 7.61	33.69 ± 9.41
Gender		
Male	71 (39.23)	124 (52.32)
Female	109 (60.22)	107 (45.15)
Other	1 (0.55)	6 (2.53)
Education		
High School or less	38 (20.99)	68 (28.69)
Some College	88 (48.62)	80 (33.76)
College	55 (30.39)	89 (37.55)
Cigarettes per day		
11-20	142 (78.45)	
21-30	36 (19.89)	
31 or more	3 (1.66)	
Fagerström test for cigarette dependence (M ± SD)	4.42 ± 1.57	

Loss Aversion Measure

Would you accept or reject the following 50/50 gamble?

Lose -$31   Win $2

Strongly Reject | Reject | Accept | Strongly Accept

• Avg. gain amount is 2x avg. loss amount
• Accept .5 means value of loss = 2x value of gain
• >.5 is less loss averse
• <.5 is more loss averse

Loss Aversion in Smokers and Never-Smokers
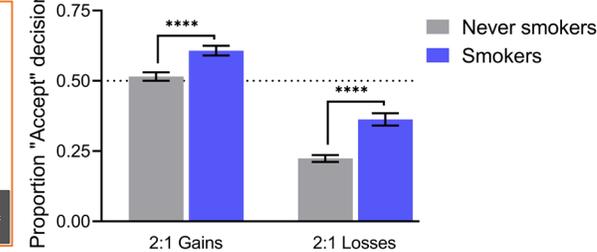
• Never-smokers were loss averse.
• Smokers were less loss averse than never smokers.
• At 2 levels of gamble value (2:1 Gains and 2:1 Losses)
• Difference was strong when accounting for Delay Discounting.

Group effects from ANOVA comparing Loss Aversion (LA) and Delay Discounting (DD) between substance using groups controlling for socio-demographic confounders (age, gender, education)

Substance use or other problem	LA			LA controlling for DD			DD			DD controlling for LA		
	F	p	df = 1, 411	F	p	df = 1, 410	F	p	df = 1, 411	F	p	df = 1, 410
Cigarette smoking	24.19	<.0001	****	20.53	<.0001	****	20.55	<.0001	****	16.98	<.0001	****
Alcohol	23.38	<.0001	****	21.47	<.0001	****	4.52	0.0341	*	2.74	0.0986	
Other drugs	58.17	<.0001	****	54.12	<.0001	****	10.04	0.0016	**	6.47	0.0113	*
Smoking & alcohol	29.91	<.0001	****	26.37	<.0001	****	14.63	0.0002	***	11.25	0.0009	***
Smoking & drugs	67.61	<.0001	****	63.28	<.0001	****	9.61	0.0021	**	5.91	0.0155	*
Alcohol & drugs	75.00	<.0001	****	70.72	<.0001	****	8.38	0.004	**	4.82	0.0287	*
Smoking, alcohol, & drugs	73.03	<.0001	****	68.82	<.0001	****	8.26	0.0043	**	4.72	0.0304	*
Depressed mood	2.28	0.1320		1.98	0.1598		0.96	0.3275		0.72	0.3967	
Sleep disturbance	0.46	0.4970		0.37	0.5439		0.47	0.4947		0.35	0.5538	

• Groups were dichotomized on other substance use (alcohol, other drugs) items and their combinations (poly-use).
• Substance using groups were less loss averse than non-using groups.
• No difference in Loss Aversion or Delay Discounting observed between groups reporting depressed mood or sleep disturbance.

Analysis of Loss Aversion and Delay Discounting as risk factors
• With the entire sample, we created four groups based on median splits of Loss Aversion (High LA, Low LA) and Delay Discounting (High DD, Low DD).
• Logistic regression found that having low LA increased risk of substance use across each substance use category.
• Low LA increased risk of substance use even in the presence of High DD.
• Interestingly, the reverse was not observed: High DD did not increase risk for substance use in the presence of Low LA.
• Low loss aversion and high delay discounting may not be additive contributors to substance use risk (Preliminary).
• Other analysis suggest that LA is related to severity, but range is restricted in this dataset (>10 CPD criterion).
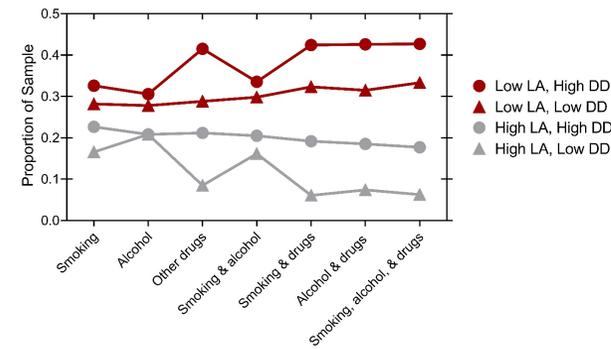
Discussion

• Smokers were less loss averse than never-smokers.

• Never smokers accepted half the gambles consistent with losses having approximately twice the value of equivalent gains

• Smokers systematically accepted more gambles which suggests that losses had a weaker influence on choice.

• Smokers discounted more steeply than never-smokers (a control measure).

• Differences in Loss Aversion were also observed between groups dichotomized on other substance use items (alcohol, other drugs), but not other behavioral-health problems (sleep disturbance, depressed mood).

• Differences in Loss Aversion remained highly significant when accounting for socio-demographics and differences in Delay Discounting.

• Loss Aversion and Delay Discounting are strong and independent risk factors for cigarette smoking and other substance use.

• Crowdsourced sample limits strong conclusions.

• Additional work is underway to extend this procedure to a diverse and representative sample.

• Loss aversion deserves attention as a possible preventive factor and intervention target.