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Predicting Health Behaviors with Economic Preferences and Perceived Control

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Abstract

We present new evidence on the relationship between health behaviors and experimental measures of risk and time preferences and introduce evidence that perceived control—a measure incorporated from the health psychology literature—is a stronger and more consistent predictor of health behaviors than economic preferences.

JEL codes: C91, D03, I12

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1 Introduction

In this note we provide new evidence on the relationship between individual preferences and health behavior. We supplement the literature relating experimentally measured risk and time preferences to individual behaviors by incorporating a construct from the health psychology literature—a measure of perceived control over outcomes—which we find to be a stronger predictor of health behaviors than either quantitative or qualitative measures of risk and time preference.

Fuchs (1982) was the first to empirically relate experimentally measured preferences to individual behaviors, including several related to health. He found that individuals who were more future-oriented were more likely to exhibit behaviors associated with positive health consequences—such as exercising and seeking preventive health care—and less likely to exhibit behaviors associated with negative health consequences—such as smoking and eating unhealthy foods. There is a growing literature focused on relating experimentally measured risk and time preferences to health behaviors and outcomes such as smoking (Sutter et al. forthcoming; Harrison et al. 2004; Chabris et al. 2008; Anderson and Mellor 2008; Barsky et al. 1997), drinking (Sutter et al. forthcoming; Anderson and Mellor 2008; Barsky et al. 1997), cocaine and heroin abuse (Kirby and Petry 2010), obesity (Anderson and Mellor 2008; Komlos et al. 2004), seat belt usage (Anderson and Mellor 2008), and demand for medical screening tests (Picone et al. 2004) and vaccines (Chapman and Coups 1999). While these surveys find some effects of time and risk preferences on various health behaviors, the evidence is not consistent across studies and the magnitudes of the effects found are often small. We add further evidence on the relationship between risk and time preferences and health behaviors, in a sample of students, but we do not find strong evidence of a relationship between time preference and health behaviors, and the magnitude of the risk preference effects we find is relatively small when compared with another individual characteristic we consider: perceived control over outcomes.

The health psychology literature includes a large body of evidence that an individual's perceived control over future health outcomes impacts her investments in health (see Conner and Norman (2005) for reviews of various measures of perceived control including self-efficacy and health locus of control). Measures of perceived control have not generally been incorporated into studies using individual preferences to predict health behaviors. An exception to this is Chapman and Coups' (1999) study of demand for a flu vaccine, which includes measures of flu-specific perceived control but finds no evidence of a significant relationship between perceived

control and demand for the vaccine. We include a general measure of perceived control and find evidence that this measure is strongly associated with both increased preventive and potentially risky health behaviors. This finding suggests that perceived control is an important measure to consider for researchers interested in predicting health behavior from individual characteristics.

2 Methods

We analyze survey data from 144 students enrolled in a large public university's Master's of Public Health (MPH) program. Our sample is predominantly female (115/144). The students range in age from 21 to 55, with a median age of 27. Our sample is just over half white (74/144), with 37 Asian or Pacific Islander students, 14 Hispanic students, 9 Black students, and 10 students who indicated their racial/ethnic background as "other."

After completing a questionnaire to collect background demographic information, our subjects answered questions about health behavior and then completed questions eliciting risk and time preferences. The survey was incentivized by randomly selecting one question and one subject who was paid at the end of the session based on her decision in the chosen question. Participants were informed of this incentivization design prior to the survey.

The four questions that make up our risk aversion index consist of choices between risky and less risky gambles. For example: "Would you rather have (a) a one-half chance of \$8 and a one-half chance of \$11 or (b) a one-third chance of \$7 and a two-thirds chance of \$14?" The question we use as a measure of myopia is a choice between receiving a smaller amount at a sooner time against a larger amount in the future.

Given the limitations of our sample size, we do not attempt to use factor analysis to guide the construction of our preference measures; however, we do run an exploratory factor analysis to check that it matches our intuition for the grouping of questions into preference measures. Based on this analysis we threw out one question intended to measure myopia and we decided to analyze risk aversion over losses as a measure distinct from standard risk aversion. We also use two survey questions as qualitative measures of risk aversion and time preference. In these questions students were asked to report how strongly they agreed or disagreed with the statements "I enjoy the thrill of physically dangerous sports/activities" and "I enjoy the moment and don't worry about the future."

We also included a general measure of perceived self-control where participants were simply asked to report their level of agreement with the statement: "I have control over my life."

We analyze 10 questions on health behavior. Seven of these questions elicited self-reported frequency of engaging in a given activity (never, occasionally, once a week, more than once a week, or once a day or more). These activities were taking vitamins, flossing your teeth, exercising (for at least 30 minutes), eating fast food, smoking, having unprotected sex, and drinking alcohol. Three additional items asked respondents to report how strongly they agreed or disagreed with a given statement. The statements were that they: "usually eat healthy food," "almost always wear a seatbelt," and "go to the doctor/dentist as often as I should."

Rather than analyzing each health outcome separately, we use exploratory factor analysis to derive two indices combining health behaviors that appear to be driven by a common underlying factor. We use iterated principal axis factor analysis with a promax rotation to extract two factors from these 10 items. In this analysis, flossing, exercising, eating fast food, eating healthy food, and visiting the doctor/dentist loaded onto one factor while smoking, drinking alcohol, and having unprotected sex load onto a second factor. Here we retained those items that had a loading higher than 0.25 on a factor. We use this low threshold because the two factors suggested by this rule also coincide with our intuition and are supported by past research (see, for example, Tapp and Goldenthal 1982). The first factor appears to represent preventive health behavior, while the second factor represents more active disinhibition. Factor 1 accounts for approximately 56 percent of the variance in the data and Factor 2 accounts for approximately 45 percent of the variance in the data. We construct the following measures, with each behavior weighted according to the factor loadings obtained in our analysis:

$$\begin{aligned}\text{Factor 1} &= (.35 \times flossing) + (.55 \times exercise) - (.45 \times fastfood) + (.56 \times healthyfood) \\ &\quad + (.48 \times dentistdoctor) \\ \text{Factor 2} &= (.31 \times smoke) + (.32 \times unprotectedsex) + (.80 \times alcohol)\end{aligned}$$

3 Results

OLS regressions of Factor 1 (preventive health behavior) and Factor 2 (disinhibition) on demographic controls, preference measures, and perceived control are presented in Table 1. We find that risk aversion has a significant positive association with Factor 1 ($\beta = 0.15$, $p = 0.04$) and that self-regarded thrill-seeking—a qualitative measure decreasing in risk aversion—is significantly associated with Factor 2 ($\beta = 0.15$, $p = 0.02$).

Perceived control is associated with significant increases in both Factors 1 and 2 ($\beta = 0.57$,

$p < 0.01$ and $\beta = 0.23, p = 0.02$, respectively). The former effect is consistent with the idea that preventive behavior increases with perceived control because the individual conceives of her behavior as an important determinant of future outcomes. The latter effect is consistent with the idea that perceived control may also increase an individual's belief that she will be able to control current overindulgence and/or limit future negative consequences of her actions, which we expect may increase demand for cigarettes and alcohol and potentially decrease planning for contraception. Indeed, perceived control is the only measure other than gender that is associated with both factors; and in regressions predicting each health behavior individually (see Table 2), perceived control is a significant predictor of all but two behaviors (fast food consumption and unprotected sex). The magnitude of the effect of perceived control is also significant, equivalent to around half of the difference explained by gender.

Myopia is not significantly related to either of our health behavior factors. When we analyze each health behavior individually we find that only exercise is significantly associated with myopia, with more myopic individuals tending to exercise more ($\beta = 0.15$, $p < 0.01$). This finding is consistent with a view of exercise as providing immediate gratification, in contrast to the view of exercise as a preventive health behavior which is standard in the literature (see, for example, Chabris et al. 2008; Komlos et al. 2004). Chabris et al. note this potential for two different views of motivation for exercise (p. 264), and of the three studies they analyze they find a significant negative association between time discounting and exercise in one, and insignificant associations (with mixed signs) between discounting and exercise in the other two.

We find that risk aversion over losses (as opposed to risk aversion restricted to positive domains) is a significant predictor only of self-reported visiting the doctor and dentist as often as I should ($\beta = 0.46$, $p < 0.01$).

Our results on the relationship between quantitative preference measures and behaviors are robust to exclusion of the qualitative preference measures from the model.

4 Discussion

In this note we introduce to the economics literature evidence that perceived control is an important predictor of health behavior and we add further evidence that time and risk preferences explain some variation in health behaviors. Our findings motivate future work investigating the link between risk and time preferences and health behavior and the potentially mediating factor of perceived control. Our results also suggest that qualitative measures of risk and time preferences may explain some behavior that game-elicited measures fail to capture, motivating

further work investigating when each type of measure is most useful and which survey questions have the greatest predictive power.

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5 Tables

Table 1: Health Behavior Factors

	(1) Factor 1 (preventive behavior)	(2) Factor 2 (disinhibition)
Age (decades)	-1.94*	0.56
	(1.08)	(0.91)
Age sq. (decades)	0.28*	-0.11
	(0.15)	(0.13)
Female	1.16***	-0.54**
	(0.26)	(0.22)
Parental education	-0.04	0.38***
	(0.10)	(0.08)
Cognitive Index	0.12	-0.23
	(0.18)	(0.15)
Risk Aversion	0.15**	0.07
	(0.07)	(0.06)
Loss Aversion	0.22	-0.12
	(0.21)	(0.18)
Myopia	0.12	0.06
	(0.08)	(0.06)
Control	0.57***	0.23**
	(0.12)	(0.10)
Enjoy thrill	0.09	0.15**
	(0.08)	(0.07)
No future worry	-0.11	0.06
	(0.10)	(0.08)
Observations	144	143
R^2	0.352	0.361

Standard errors in parentheses

Factor 1: flossing, exercise, fast food, and healthy food; Factor 2: smoking, alcohol, unprotected sex

OLS regressions. Race is also included in regressions.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2: Individual Health Behaviors

	(1) alcohol	(2) dentistdr	(3) exercise	(4) fastfood	(5) flossing	(6) healthyfood	(7) seatbelt	(8) smoke	(9) unprotectedsex	(10) vitamin
Age (decades)	1.04	-1.27	-1.25	0.54	-0.51	-0.43	-0.72	-1.02*	0.03	-1.36
	(0.87)	(0.83)	(0.80)	(0.57)	(1.20)	(0.73)	(0.64)	(0.61)	(1.08)	(1.40)
Age sq. (decades)	-0.18	0.22*	0.15	-0.07	0.09	0.07	0.10	0.15*	-0.02	0.25
	(0.12)	(0.12)	(0.11)	(0.08)	(0.17)	(0.10)	(0.09)	(0.09)	(0.15)	(0.20)
Female	-0.40*	1.06***	0.41**	-0.23	0.46	0.34*	0.10	-0.13	-0.51*	-0.35
	(0.21)	(0.20)	(0.19)	(0.14)	(0.29)	(0.18)	(0.15)	(0.15)	(0.26)	(0.34)
Parental education	0.33***	0.12	-0.07	0.02	-0.06	-0.06	0.05	0.07	0.25**	-0.01
	(0.08)	(0.08)	(0.07)	(0.05)	(0.11)	(0.07)	(0.06)	(0.06)	(0.10)	(0.13)
Cognitive Index	-0.11	0.14	-0.12	-0.08	0.09	0.10	0.27**	-0.12	-0.28	0.10
	(0.14)	(0.13)	(0.13)	(0.09)	(0.19)	(0.12)	(0.10)	(0.10)	(0.18)	(0.23)
Risk Aversion	0.07	0.03	0.09*	-0.04	0.10	0.06	-0.01	0.03	0.00	0.04
	(0.06)	(0.05)	(0.05)	(0.04)	(0.08)	(0.05)	(0.04)	(0.04)	(0.07)	(0.09)
Loss Aversion	-0.12	0.46***	-0.02	-0.05	-0.03	0.02	0.05	0.11	-0.13	0.06
	(0.17)	(0.16)	(0.15)	(0.11)	(0.23)	(0.14)	(0.12)	(0.12)	(0.21)	(0.27)
Myopia	0.08	0.01	0.15***	-0.06	-0.02	0.02	-0.05	-0.06	0.03	0.00
	(0.06)	(0.06)	(0.06)	(0.04)	(0.09)	(0.05)	(0.05)	(0.04)	(0.08)	(0.10)
Control	0.20**	0.24**	0.21**	-0.09	0.40***	0.31***	0.19**	0.12*	0.09	0.24
	(0.10)	(0.09)	(0.09)	(0.06)	(0.14)	(0.08)	(0.07)	(0.07)	(0.12)	(0.16)
Enjoy thrill	0.11	0.10	0.18***	0.08*	0.00	-0.04	0.01	0.10**	0.10	0.10
	(0.06)	(0.06)	(0.06)	(0.04)	(0.09)	(0.05)	(0.05)	(0.05)	(0.08)	(0.10)
No future worry	0.09	-0.13*	0.06	-0.03	-0.21*	-0.06	-0.02	-0.00	-0.07	-0.15
	(0.08)	(0.08)	(0.07)	(0.05)	(0.11)	(0.07)	(0.06)	(0.06)	(0.10)	(0.13)
Observations	144	144	144	144	144	144	144	144	143	144
R^2	0.331	0.371	0.286	0.152	0.133	0.157	0.128	0.188	0.147	0.084

Standard errors in parentheses

OLS regressions; Race is also included in regressions.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Instructions

Welcome to this experiment on decision-making, and thank you for agreeing to participate. The experiment will consist of two parts, in each of which you will be asked to answer a series of questions. There are no right or wrong answers to these questions; they merely reflect personal individual preferences. Furthermore, your answers to all questions will remain entirely confidential and anonymous. We will not ask for your name or other identifying information at any time. You will not be asked to reveal your identity or your decisions, or even the fact that you participated, to anyone else (the experimenter, your professor, or other participants) at any time during or after the course of this session.

In order to maintain this privacy and confidentiality (both for yourself and for the other participants), please do not speak with anyone during the experiment, and please do not reveal your choices to anyone even after the conclusion of the experiment. It is also important that after you have answered a particular question and moved on to the next one, you are not allowed to return to any previous question and change your answer – so think carefully.

The first part of the experiment consists of survey-type questions about your background and behaviors. Since this is important for our research (and because your answers will remain entirely anonymous), please be honest in your responses. You may skip any question[s] that make[s] you feel uncomfortable.

The second part of the experiment asks some hypothetical questions about your preferences with regard to different situations. There are a variety of types of questions, but one example is:

[see next page]

"Would you rather have:

A) One-half chance (i.e. 50%) of **$8** and one-half chance of **$11**;

or

B) One-third chance (33.3%) of **$7** and two-thirds chance of **$14** ?

Please circle your final decision: ***A*** or ***B***"

In this example, if you choose ***B***, are you more likely to get above $12 or less than $12?
If you choose ***A***, what is the probability that you will get exactly $9.50?

Are there any questions before we start??

Background Information

Please answer the following questions. You may decline to answer any particular question if it would make you uncomfortable.

1. What is your age? [in years] _____

2. What is your gender? [please circle] **Female** or **Male**

3. What is your race/ethnicity? [please mark one]
   1 – African American
   2 – Asian / Pacific Islander
   3 – Caucasian
   4 – Hispanic
   5 – Other:

4. What was your college major (field of study)?
   1 – Life sciences (biology, pre-med, etc)
   2 – Physical sciences (chemistry, math, astronomy, etc)
   3 – Social sciences (psychology, economics, etc)
   4 – Humanities (literature, arts, languages, etc)
   5 – Engineering (including computer science)

Please use the following numbers to answer the next two questions:
   1 – did not finish high school
   2 – high school graduate
   3 – some college
   4 – college graduate
   5 – postgraduate

5. What is your father's level of education? _____

6. What is your mother's level of education? _____

Health Information

7. What is your height? [in feet/inches] _____

8. What is your weight? [in pounds] _____

Please use the following scale to answer questions 9-16:

1 – never
2 – occasionally
3 – once a week
4 – more than once a week
5 – once a day (or more)

How often, *on average*, do you engage in each of these activities?

9. Take vitamins _____

10. Floss your teeth _____

11. Exercise (at least 30 minutes) _____

12. Eat fast food _____

13. Smoke _____

14. Drive a vehicle while fatigued _____

15. Drink alcohol _____

16. Feel depressed or anxious _____

Please use the following scale to answer questions 17-24:

1 – strongly disagree
2 – somewhat disagree
3 – indifferent / don't know
4 – somewhat agree
5 – strongly agree

17. I usually eat healthy food _____

18. I almost always wear a seatbelt _____

19. I go to the doctor/dentist as often as I should _____

20. I enjoy the thrill of physically dangerous sports/activities _____

21. I have control over my life _____

22. I tend to get along with my family _____

23. I enjoy the moment and don't worry about the future _____

24. If I had a disability, I would choose to undergo surgery, even if it were very risky, rather than have to live with it for the rest of my life _____

25. Overall, how would you rate your current health?

1 – Poor
2 – Fair
3 – Good
4 – Very good
5 – Excellent

Part II: Individual Decisions

1. Would you rather have:

A) Certain (i.e. 100% chance of) **$9**;

or

B) One-half chance (i.e. 50%) of **$3** and one-half chance of **$20** ?

Please circle your final decision: ***A*** or ***B***

2. Would you rather have:

A) Two-thirds chance (66.7%) of **$9** and one-third chance of **$11**;

or

B) Two-thirds chance (66.7%) of **$3** and one-third chance of **$37** ?

Please circle your final decision: ***A*** or ***B***

3. Would you rather have:

A) One-half chance (50%) of **$18** and one-half chance of **$5**;

or

B) Certain (100% chance of) **$10**;

or

C) One-half chance (50%) of **$25** and one-half chance of **$2** ?

Please circle your final decision: ***A*** or ***B*** or ***C***

4. Would you rather have:

A) One-sixth chance (16.7%) of **$18** and five-sixths chance of **$7**;

or

B) One-sixth chance (16.7%) of **$44** and five-sixths chance of **$3** ?

Please circle your final decision: ***A*** or ***B***

Note: For this question imagine that you are given $20 to start with.

5. Would you rather lose (i.e. have to pay us back):

A) One-half chance (50%) of **$0** and one-half chance of **$17**;

or

B) Certain (100% chance of) **$11** ?

Please circle your final decision: ***A*** or ***B***

For this question imagine that you will be randomly matched with another person in the room. Your decision would affect both your outcome and their outcome, but you will remain entirely anonymous at all times (i.e. they will never find out who you are).

6. Would you rather have:

A) $**12** for you and $0 for the other person;

or

B) $**10** for you and $2 for the other person;

or

C) $**8** for you and $4 for the other person;

or

D) $**6** for you and $6 for the other person ?

Please circle your final decision: ***A*** or ***B*** or ***C*** or ***D***

For this question imagine that you will be randomly matched with another person in the room. Your decision would affect both your outcome and their outcome, but you will remain entirely anonymous at all times (i.e. they will never find out who you are).

7. Would you rather have:

A) $**5** for you and $5 for the other person;

or

B) $**4** for you and $9 for the other person;

or

C) $**6** for you and $2 for the other person ?

Please circle your final decision: ***A*** or ***B*** or ***C***

For this question imagine that you will be randomly matched with two other people in the room. Your decision would affect both your outcome and their outcomes, but you will remain entirely anonymous at all times (i.e. they will never find out who you are, or who each other are).

8. Would you rather have:

A) $**4** for you, $4 for the second person, and $4 for the third person;

or

B) $**4** for you, $5 for the second person, and $5 for the third person;

or

C) $**4** for you, $3 for the second person, and $10 for the third person ?

Please circle your final decision: ***A*** or ***B*** or ***C***

For this question you must make a decision regarding receiving a payoff at one of various points in time. Imagine that if you choose one of the later dates, we would send you a check so that you receive it after exactly the delay specified. You would not have to do anything extra or go anywhere in order to obtain the money.

9. Would you rather have:

A) $**10** right now (i.e. at the end of this session);

or

B) $**12** in one week (7 days) from now;

or

C) $**14** in one month (30 days) from now;

or

D) $**16** in three months (92 days) from now ?

Please circle your final decision: ***A*** or ***B*** or ***C*** or ***D***

For this question you must make a decision regarding receiving a payoff at one of various points in time. Imagine that if you choose one of the later dates, we would send you a check so that you receive it after exactly the delay specified. You would not have to do anything extra or go anywhere in order to obtain the money.

10. Would you rather have:

A) One-half chance (50%) of **$13** in one month, and one-half chance of **$9** in one month;

or

B) One-half chance (50%) of **$2** right now, and one-half chance of **$20** right now?

Please circle your final decision: ***A*** or ***B***

Bonus Question

Imagine that if you pick the random choice, we will roll 3 dice to determine if you win. Each die has six sides, so this means that your probability of winning the grand prize would be 1 in 216 (or approximately 0.46%).

Would you rather have:

A) Certain (100% chance of) **$2**;

or

B) Random chance of **$250** ?

Please circle your final decision: ***A*** or ***B***