



HHS Public Access

Author manuscript

Behav Anal (Wash D C). Author manuscript; available in PMC 2019 May 01.

Published in final edited form as:

Behav Anal (Wash D C). 2018 November ; 18(4): 333–339. doi:10.1037/bar0000105.

Behavioral Economic Research in Addiction as an Area of Growth for the Experimental Analysis of Behavior

Rachel N. Cassidy, Ph.D.¹ and Allison N. Kurti, Ph.D.²

¹Center for Alcohol and Addiction Studies, Brown University

²University of Vermont

Abstract

Behavioral economics, a synthesis of the experimental analysis of behavior (EAB) and economics, seeks to determine the relative value of reinforcers as a function of various environmental constraints. Early animal and human studies often focused on drug reinforcement, and this has continued to the present. In particular, behavioral economic analyses of human and animal behavior in relation to nicotine and cigarette smoking have contributed to a greater understanding of this behavior, and to a greater reliance on these methods in the field of smoking cessation treatment, tobacco regulatory science and tobacco control. In this commentary, we briefly describe the history of behavioral economics in the context of EAB methods, the particular contribution of these methods to understanding cigarette smoking and the advance of tobacco regulation, as well as opportunities for growth and remaining challenges in this area. As behavioral economics continues to stimulate research and inform policy, we propose that the underlying elements of a rigorous analytic approach to understanding behavior are key contributors to the fruitfulness of this approach.

Keywords

Behavioral economics; smoking; tobacco; public policy

The experimental analysis of behavior (EAB), and in particular the focus on precise laboratory-based methodology that has characterized the field from its inception, has been argued to be a framework in terminal decline due to a lack of focus on important issues (e.g., Mace & Critchfield, 2010). We seek to demonstrate that the ethos of EAB is alive and well in translational applications that have allowed the methodological imperatives of EAB to permeate larger applied disciplines. In this commentary, we focus on the behavioral economic framework and its applications in the field of drug abuse research. We argue that several key elements of EAB, including a focus on environmental variables that influence behavior, parametric manipulation of independent variables, and cross-species comparisons have strongly contributed to the importance of behavioral economic research in the field of drug abuse, and particularly research on cigarette smoking.

The field of behavioral economics grew out of a synthesis between the experimental analysis of behavior (EAB) and economics (Hursh, 1980; Hursh, 1984). The fields are seemingly dissimilar, but early researchers saw similarities: EAB experiments seek to systematically determine the influence of environmental variables on response rates maintained by a reinforcer, and economic conceptualizations focus on how changing environmental economic variables (e.g., scarcity, cost of a good) affects consumption of that good. While EAB refers to 'reinforcers', economics refers to 'goods' - in both cases items that an individual organism consumes or that can maintain high rates of behavior. While traditional EAB describes the 'reinforcing efficacy' of a good, economics uses the term 'value' - the greater behavior that is maintained by that good, the greater the value; and the greater the level of persistence in responding in the face of increasing constraints, the greater the value (Bickel, DeGrandpre, & Higgins, 1993; Reed, Niileksela, & Kaplan, 2013).

Early research in the field of behavioral economics focused on precise experimental manipulation of the variables of interest, while using the language and conceptual framework of economics, which facilitated translation of basic experiments to larger policy issues. From the very start, drugs of abuse were of special interest to the field (Bickel et al., 1993; Hursh, 1991). In some traditional economic theories, actors make perfectly rational choices to select goods that maximize their overall utility (Ainslie, 2016; Hursh & Roma, 2013). From this perspective, problematic drug use is difficult to reconcile and appears to be 'irrational.' Who would choose to maximize their overall utility by becoming an addict? Leaving aside this traditional assumption, EAB-focused behavioral economists took an operant view of drug abuse: Drugs are reinforcers that can maintain behavior, and because their deleterious outcomes are often delayed and cumulative in nature, these punishing effects have less control over behavior relative to the immediate reinforcement associated with using drugs (Bickel, Johnson, Koffarnus, MacKillop, & Murphy, 2014; Stanger, Budney, & Bickel, 2013). Despite the punishing effects of drugs in the long term, the immediate reinforcing effects mean that both animals and humans will respond at high rates for these substances: As behavioral economists would term it, there is high demand for these goods.

The core concept of behavioral economics is demand. This term encompasses the relationship between the amount of a reinforcer that is earned or consumed and the behavior that produces it across a range of prices. In the animal literature, the 'price' in question is typically a fixed ratio (FR) schedule (Bentzley, Fender, & Aston-Jones, 2013; Hursh, 1993). As the FR increases, the amount of the food or drug reinforcer earned by the animal decreases. From the resulting demand curve plotting reinforcers earned as a function of FR, several indices can be calculated which precisely quantify elements of this relationship. The demand function emphasizes that the relationship between the environment and behavior is dynamic, and assessment under only one price or condition is not enough to establish the reinforcing value of a good. This parametric relationship helps explain why behavioral economics has been able to make such an impact on the field of drug abuse research: Indices of demand, such as the amount earned at free or at very low cost (FR 1) and the persistence of responding as price increases (elasticity), can be compared across drug type, including for novel drugs, as well as compared for a given drug before and after a treatment such as pharmacotherapy (Hursh & Silberberg, 2008). In other words, these indices provide a

quantitative measure of the reinforcing efficacy of drugs, thereby facilitating an examination of the effects of treatment on the reinforcing efficacy of drugs.

Shortly after its inception, the potential for application of behavioral economic methods to human laboratory studies was realized. In these studies, participants were asked to complete ratios of button-presses or other operant measures to gain access to reinforcers such as cigarettes or points exchangeable for money (Banks & Negus, 2017; Jones & Comer, 2013). Increasing the FR requirement across conditions allowed researchers to apply the same demand curve calculations that were possible with animal experiments, which opened the door to cross-species comparisons and underscored the translational applicability of this process. However, this method was time-consuming and potentially ecologically invalid. The next step was twofold: first, to put price into terms that reflect the real world (after all, people know how much their drugs cost), and to use hypothetical self-report measures to increase the efficiency of obtaining demand curves. Thus, the hypothetical purchase task, which asks participants how much of a given drug they would consume at a series of progressively increasing prices, was born (Jacobs & Bickel, 1999; Murphy & MacKillop, 2006). The rigorous, laboratory-based methodology from which behavioral economics grew, and the emphasis on parametric manipulation which hypothetical purchase tasks retained, facilitated the wide adoption of a behavioral economic framework in the area of drug abuse research beyond the laboratory. Thus far, purchase tasks have been developed for alcohol, cigarettes, marijuana, and other products; and are a well-validated method of obtaining demand data and have been widely disseminated (Aston, Farris, MacKillop, & Metrik, 2017; MacKillop et al., 2008, 2010; Murphy, MacKillop, Skidmore, & Pederson, 2009; Roma, Hursh, & Hudja, 2015).

Research on nicotine and cigarette use provides a case study in the application of behavioral economic methods and theory across the translational spectrum from animal studies, to human laboratory studies, to treatment and policy applications. Animal studies have used behavioral economic methods to quantify demand for nicotine across increasing unit prices (Smith, Sved, Hatsukami, & Donny, 2014) and to understand how nicotine affects the reinforcing value of other commodities (Cassidy & Dallery, 2012, 2014), demonstrating a model of the fundamental behavioral processes underlying nicotine dependence in humans. Behavioral economic methods have also been used in human laboratory preparations to understand to what extent other forms of nicotine, such as the patch and gum, may substitute for nicotine delivered via cigarettes (Johnson, Bickel, & Kirshenbaum, 2004), and to model the effects of availability of other reinforcers on demand for cigarettes (Cassidy, Tidey, Kahler, Wray, & Colby, 2015; DeGrandpre, Bickel, Higgins, & Hughes, 1994; Johnson & Bickel, 2003; Stoops, Poole, Vansickel, & Rush, 2011). Understanding how such potential substitutes may affect demand for cigarettes can help delineate the circumstances under which these products and interventions will be effective treatments for smoking.

The behavioral economic framework also provides a way to understand mechanisms of treatment response. For example, demand indices derived from purchase task data have been used to predict smoking treatment response (MacKillop et al., 2015), with results of such studies indicating that one's sensitivity to reinforcement from smoking can be an important indicator of the likelihood that his or her behavior will be changed by an intervention. Such

information can identify individuals who may need stronger ‘doses’ of a treatment (Renaud & Halpern, 2010; Tidey, 2016). Behavioral economic tasks which evaluate the value of cigarettes can also be administered across time to quantify whether and how treatments affect the value of smoking (Schlienz, Hawk, Tiffany, O’Connor, & Mahoney, 2014; Secades-Villa, Pericot-Valverde, & Weidberg, 2016). Finally, behavioral economics data from hypothetical purchase tasks have been used to assess how individuals may respond to policy changes that would reduce the level of nicotine in cigarettes (Smith et al., 2017). The breadth of this translation underscores both the robust methodology of behavioral economics, along with the extent to which the overarching behavioral framework applies to individual behavior across multiple levels of analysis.

As behavioral economics has been recognized as a fruitful avenue for research, new opportunities to disseminate this framework have arisen. This framework has been increasingly recognized as a way for drugs, and novel tobacco products in particular, to be assessed for abuse liability. Behavioral economic purchase tasks are being developed for e-cigarettes (Cassidy, Tidey, Colby, Long, & Higgins, 2017), which are electronic devices that deliver nicotine-containing aerosol without combustion, and human laboratory methods for evaluating the impact of these products on demand for cigarettes are enjoying a resurgence (Grace, Kivell, & Laugesen, 2015; Quisenberry, Koffarnus, Epstein, & Bickel, 2017). Such behavioral economic assessments have become part of how such products are evaluated by the Food and Drug Administration (Henningfield, Buchhalter, & Fant, 2016; Tidey, Cassidy, Miller, & Smith, 2016), illustrating the increasing relevance of these methods in policy applications.

These positive contributions notwithstanding, behavioral economic tasks present a few challenges to researchers. First, data from some proportion of participants who complete behavioral economic measures including hypothetical purchase tasks are often excluded from data analyses due to inattentive or non-systematic responding (e.g., Johnson, Herrmann, & Johnson, 2015). Taking steps to verify response fidelity (e.g., providing all participants with clear instructions about the task and verifying their understanding) as well as using rigorous manipulation checks may increase participant attention and response fidelity. Second, when behavioral economic tasks are administered in the laboratory, researchers may be limited in terms of the number of subjects they can recruit, the demographic and drug use variability in the resulting sample, and it may be difficult to target hard-to-reach populations. Growing research using crowdsourcing approaches (e.g., conducting studies online using Amazon Mechanical Turk) circumvents these problems (Mason & Suri, 2012) and thus far has produced similar outcomes as laboratory studies (Johnson et al., 2015; Strickland et al., 2016a; Strickland et al., 2016b). Third, while hypothetical purchase tasks are generally less time-consuming than human operant procedures, even these self-report measures can be time-intensive, for example some versions of the hypothetical cigarette purchase task contain up to 60 price points (MacKillop et al., 2012). Fortunately, research is emerging that supports the initial validation of abbreviated (e.g., three price points) purchase tasks (e.g., Owens, Murphy, & MacKillop, 2015), which are presumably more practical to administer in human laboratory and clinical settings, and may have the added benefit of reducing the proportion of data that is discarded due to inattentive or non-systematic responding.

While behavioral economics has made great strides, particularly in the field of substance abuse, there is ample opportunity for future research. One area of research involves extending purchase task measures to other, non-substance-related addictive behaviors, which currently are lacking. Reed et al., 2016 developed an innovative Tanning Purchase Task to discriminate between individuals who may be addicted to sunless tanning beds and those who are not (Reed et al., 2016); however, purchase tasks for other potentially addictive behaviors such as video gaming or access to other reinforcers have not yet been developed. Similarly, extant purchase tasks rarely attempt to model the influence of external factors, such as the presence of other commodities or situations that may affect demand, though promising research suggests that this can be done. For example, research has demonstrated that alcohol demand was sensitive to a hypothetical scenario in which the individual was instructed to assume that they have important obligations (such as an exam) in the morning (Skidmore & Murphy, 2011). Research on how best to model such factors and scenarios holds promise for greatly extending the utility of these tasks. Finally, many of the insights from behavioral economic work have yet to be translated into effective interventions. Thus far, behavioral economic-influenced interventions which focus on reducing the relative value of abused substances have been developed and tested for alcohol (Murphy et al., 2012) and marijuana use (Yurasek, Dennhardt, & Murphy, 2015); however, many fruitful avenues for extending behavioral economics to treatment remain unexplored.

Behavioral economics grew out of traditional behavior analytic laboratory methods and retains many of its key elements, including a focus on relationships between a measure of behavior and an environmental variable, the parametric testing of the influence of an independent variable, and a focus on comparison of data across species. The increasing influence of behavioral economics in understanding basic behavioral processes underlying smoking and the use of this knowledge in formulating empirically based tobacco control policy is an area in which EAB remains relevant. As a recent theoretical review by Bickel, Moody, & Higgins (2016) makes clear, behavioral economics has also contributed to the greater field of health behavior change by emphasizing commonalities across behavioral processes operating in domains as different as medication adherence (DeFulio & Silverman, 2012), overeating (Jeffery, 2012), and organ donation (Ugur, 2015); and identifying ways to increase desirable behavior and decrease undesirable health behaviors by understanding and altering the relative value and costs of different reinforcers in the environment (Meredith et al., 2014). As these methods have been more widely adopted, behaviorist ideas come along with them in ways that are both important and wide-ranging. Impactful empirical data on demand for drugs, and the relationship of demand to external factors, frames a policy discussion in a way that emphasizes the environmental control of behavior, and creates a solid footing for theoretical discussions about the causes of addiction more broadly to be framed in behavioral terms. We look forward to continued growth in this area, and encourage behavior analysts to look for areas in which EAB methods can contribute to helping solve real-world problems.

Acknowledgments

Manuscript preparation supported by NIH grants K01CA189300 (PI Cassidy), R03DA041820 (PI Cassidy), P50DA036114 (PI Higgins) and P20GM103644 (PI Higgins). This publication was supported by NCI and FDA

Center for Tobacco Products (CTP). The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH or the Food and Drug Administration.

References

- Ainslie G. 2016; The Cardinal Anomalies that Led to Behavioral Economics: Cognitive or Motivational? *Managerial and Decision Economics*. 37(4–5):261–273. DOI: 10.1002/mde.2715
- Aston, ER; Farris, SG; MacKillop, J; Metrik, J. Latent factor structure of a behavioral economic marijuana demand curve. *Psychopharmacology*. 2017.
- Banks ML, Negus SS. 2017; Insights from Preclinical Choice Models on Treating Drug Addiction. *Trends in Pharmacological Sciences*. 38(2):181–194. DOI: 10.1016/j.tips.2016.11.002 [PubMed: 27916279]
- Bentzley BS, Fender KM, Aston-Jones G. 2013; The behavioral economics of drug self-administration: A review and new analytical approach for within-session procedures. *Psychopharmacology*. 226(1):113–125. DOI: 10.1007/s00213-012-2899-2 [PubMed: 23086021]
- Bickel WK, DeGrandpre RJ, Higgins ST. 1993; Behavioral economics: a novel experimental approach to the study of drug dependence. *Drug and Alcohol Dependence*. 33(2):173–92. [PubMed: 8261882]
- Bickel WK, Johnson MW, Koffarnus MN, MacKillop J, Murphy JG. 2014; The behavioral economics of substance use disorders: reinforcement pathologies and their repair. *Annual Review of Clinical Psychology*. 10:641–77. DOI: 10.1146/annurev-clinpsy-032813-153724
- Bickel WK, Moody L, Higgins ST. 2016; Some current dimensions of the behavioral economics of health-related behavior change. *Preventive Medicine*. 92:16–23. DOI: 10.1016/j.ypmed.2016.06.002 [PubMed: 27283095]
- Cassidy RN, Dallery J. 2012; Effects of economy type and nicotine on the essential value of food in rats. *Journal of the Experimental Analysis of Behavior*. 97(2):183–202. DOI: 10.1901/jeab.2012.97-183 [PubMed: 22389525]
- Cassidy RN, Dallery J. 2014; Quantifying nicotine's value-enhancement effect using a behavioral economic approach. *Journal of the Experimental Analysis of Behavior*. 102(3):353–62. DOI: 10.1002/jeab.109 [PubMed: 25270581]
- Cassidy RN, Tidey JW, Kahler CW, Wray TB, Colby SM. 2015; Increasing the Value of an Alternative Monetary Reinforcer Reduces Cigarette Choice in Adolescents. *Nicotine & Tobacco Research*. 17(12):1449–1455. DOI: 10.1093/ntr/ntv033 [PubMed: 25666814]
- Cassidy R, Tidey J, Colby S, Long V, Higgins S. 2017; Initial Development of an E-cigarette Purchase Task: A Mixed Methods Study. *Tobacco Regulatory Science*. 3(2):139–150. DOI: 10.18001/TRS.3.2.2 [PubMed: 28824938]
- DeFulio A, Silverman K. 2012; The use of incentives to reinforce medication adherence. *Preventive Medicine*. 55:S86–S94. DOI: 10.1016/j.ypmed.2012.04.017 [PubMed: 22580095]
- DeGrandpre RJ, Bickel WK, Higgins ST, Hughes JR. 1994; A behavioral economic analysis of concurrently available money and cigarettes. *Journal of the Experimental Analysis of Behavior*. 61(2):1334407.doi: 10.1901/jeab.1994.61-191
- Grace RC, Kivell BM, Laugesen M. 2015; Estimating Cross-Price Elasticity of E-Cigarettes Using a Simulated Demand Procedure. *Nicotine & Tobacco Research*. 17(5):592–598. DOI: 10.1093/ntr/ntu268 [PubMed: 25548256]
- Henningfield JE, Buchhalter AR, Fant RV. 2016; Behavioral pharmacology contributions to regulation of drug and tobacco products by the Food and Drug Administration. *Behavior Analysis: Research and Practice*. 16(4):179–189. DOI: 10.1037/bar0000047
- Hursh SR. 1980; Economic concepts for the analysis of behavior. *Journal of the Experimental Analysis of Behavior*. 34(2):219–38. [PubMed: 16812188]
- Hursh SR. 1984; Behavioral economics. *Journal of the Experimental Analysis of Behavior*. 42(3):435–452. DOI: 10.1901/jeab.1984.42-435 [PubMed: 16812401]
- Hursh SR. 1991; Behavioral economics of drug self-administration and drug abuse policy. *Journal of the Experimental Analysis of Behavior*. 56(2):377–393. DOI: 10.1901/jeab.1991.56-377 [PubMed: 1955823]

- Hursh SR. 1993; Behavioral economics of drug self-administration: an introduction. *Drug and Alcohol Dependence*. 33(2):165–72. [PubMed: 8261881]
- Hursh SR, Roma PG. 2013; BEHAVIORAL ECONOMICS AND EMPIRICAL PUBLIC POLICY. *Journal of the Experimental Analysis of Behavior*. 99(1):98–124. DOI: 10.1002/jeab.7 [PubMed: 23344991]
- Hursh SR, Silberberg A. 2008; Economic demand and essential value. *Psychological Review*. 115(1): 186–98. DOI: 10.1037/0033-295X.115.1.186 [PubMed: 18211190]
- Jacobs EA, Bickel WK. 1999; Modeling drug consumption in the clinic using simulation procedures: demand for heroin and cigarettes in opioid-dependent outpatients. *Experimental and Clinical Psychopharmacology*. 7(4):412–26. [PubMed: 10609976]
- Jeffery RW. 2012; Financial incentives and weight control. *Preventive Medicine*. 55:S61–S67. DOI: 10.1016/j.ypmed.2011.12.024 [PubMed: 22244800]
- Johnson MW, Bickel WK. 2003; The behavioral economics of cigarette smoking: The concurrent presence of a substitute and an independent reinforcer. *Behavioural Pharmacology*. 14(2):137–44. DOI: 10.1097/01.fbp.0000063266.43827.42 [PubMed: 12658074]
- Johnson MW, Bickel WK, Kirshenbaum AP. 2004; Substitutes for tobacco smoking: a behavioral economic analysis of nicotine gum, denicotinized cigarettes, and nicotine-containing cigarettes. *Drug and Alcohol Dependence*. 74(3):253–64. DOI: 10.1016/j.drugalcdep.2003.12.012 [PubMed: 15194203]
- Jones JD, Comer SD. 2013; A review of human drug self-administration procedures. *Behavioural Pharmacology*. 24(5 and 6):384–395. DOI: 10.1097/FBP.0b013e3283641c3d [PubMed: 23839027]
- Mace FC, Critchfield TS. 2010; Translational research in behavior analysis: historical traditions and imperative for the future. *Journal of the Experimental Analysis of Behavior*. 93(3):293–312. DOI: 10.1901/jeab.2010.93-293 [PubMed: 21119847]
- MacKillop J, Miranda R, Monti PM, Ray LA, Murphy JG, Rohsenow DJ, ... Gwaltney CJ. 2010; Alcohol demand, delayed reward discounting, and craving in relation to drinking and alcohol use disorders. *Journal of Abnormal Psychology*. 119(1):106–14. DOI: 10.1037/a0017513 [PubMed: 20141247]
- Mackillop, J; Murphy, CM; Martin, RA; Stojek, M; Tidey, JW; Colby, SM; Rohsenow, DJ. Predictive Validity of a Cigarette Purchase Task in a Randomized Controlled Trial of Contingent Vouchers for Smoking in Individuals With Substance Use Disorders. *Nicotine & Tobacco Research: Official Journal of the Society for Research on Nicotine and Tobacco*. 2015.
- MacKillop J, Murphy JG, Ray LA, Eisenberg DTA, Lisman SA, Lum JK, Wilson DS. 2008; Further validation of a cigarette purchase task for assessing the relative reinforcing efficacy of nicotine in college smokers. *Experimental and Clinical Psychopharmacology*. 16(1):57–65. DOI: 10.1037/1064-1297.16.1.57 [PubMed: 18266552]
- Meredith SE, Jarvis BP, Raiff BR, Rojewski AM, Kurti A, Cassidy RN, ... Dallery J. 2014; The ABCs of incentive-based treatment in health care: a behavior analytic framework to inform research and practice. *Psychology Research and Behavior Management*. 7:103–14. DOI: 10.2147/PRBM.S59792 [PubMed: 24672264]
- Murphy JG, MacKillop J. 2006; Relative reinforcing efficacy of alcohol among college student drinkers. *Experimental and Clinical Psychopharmacology*. 14(2):219–27. DOI: 10.1037/1064-1297.14.2.219 [PubMed: 16756426]
- Murphy JG, MacKillop J, Skidmore JR, Pederson AA. 2009; Reliability and validity of a demand curve measure of alcohol reinforcement. *Experimental and Clinical Psychopharmacology*. 17(6): 396–404. DOI: 10.1037/a0017684 [PubMed: 19968404]
- Murphy JG, Skidmore JR, Dennhardt AA, Martens MP, Borsari B, Barnett NP, Colby SM. 2012; A behavioral economic supplement to brief motivational interventions for college drinking. *Addiction Research & Theory*. 20(6):456–465. DOI: 10.3109/16066359.2012.665965 [PubMed: 24039620]
- Quisenberry AJ, Koffarnus MN, Epstein LH, Bickel WK. 2017; The Experimental Tobacco Marketplace II: Substitutability and sex effects in dual electronic cigarette and conventional cigarette users. *Drug and Alcohol Dependence*. 178:551–555. DOI: 10.1016/j.drugalcdep.2017.06.004 [PubMed: 28732318]

- Reed DD, Niileksela CR, Kaplan BA. 2013; Behavioral Economics. Behavior Analysis in Practice. 6(1):34–54. DOI: 10.1007/BF03391790
- Renaud JM, Halpern MT. 2010; Clinical management of smoking cessation: patient factors affecting a reward-based approach. Patient Preference and Adherence. 4:441–50. DOI: 10.2147/PPA.S8913 [PubMed: 21301592]
- Roma, PG; Hursh, SR; Hudja, S. Hypothetical Purchase Task Questionnaires for Behavioral Economic Assessments of Value and Motivation. Managerial and Decision Economics. 2015. n/a-n/a.
- Schlienz NJ, Hawk LW, Tiffany ST, O'Connor RJ, Mahoney MC. 2014; The impact of pre-cessation varenicline on behavioral economic indices of smoking reinforcement. Addictive Behaviors. 39(10):1484–1490. DOI: 10.1016/j.addbeh.2014.05.008 [PubMed: 24949949]
- Secades-Villa R, Pericot-Valverde I, Weidberg S. 2016; Relative reinforcing efficacy of cigarettes as a predictor of smoking abstinence among treatment-seeking smokers. Psychopharmacology. 233(17):3103–3112. DOI: 10.1007/s00213-016-4350-6 [PubMed: 27325392]
- Skidmore JR, Murphy JG. 2011; The effect of drink price and next-day responsibilities on college student drinking: A behavioral economic analysis. Psychology of Addictive Behaviors. 25(1):57–68. DOI: 10.1037/a0021118 [PubMed: 21142332]
- Smith TT, Cassidy RN, Tidey JW, Luo X, Le CT, Hatsukami DK, Donny EC. 2017; Impact of smoking reduced nicotine content cigarettes on sensitivity to cigarette price: further results from a multi-site clinical trial. Addiction. 112(2):349–359. DOI: 10.1111/add.13636 [PubMed: 27741367]
- Smith TT, Sved AF, Hatsukami DK, Donny EC. 2014; Nicotine reduction as an increase in the unit price of cigarettes: A behavioral economics approach. Preventive Medicine. 68:23–28. DOI: 10.1016/j.ypmed.2014.07.005 [PubMed: 25025523]
- Stanger C, Budney AJ, Bickel WK. 2013; A developmental perspective on neuroeconomic mechanisms of contingency management. Psychology of Addictive Behaviors: Journal of the Society of Psychologists in Addictive Behaviors. 27(2):403–15. DOI: 10.1037/a0028748 [PubMed: 22663343]
- Stoops WW, Poole MM, Vansickel AR, Rush CR. 2011; Influence of escalating alternative reinforcer values on cigarette choice. Behavioural Processes. 87(3):302–5. DOI: 10.1016/j.beproc.2011.05.002 [PubMed: 21601619]
- Tidey JW. 2016; A behavioral economic perspective on smoking persistence in serious mental illness. Preventive Medicine. 92:31–35. DOI: 10.1016/j.ypmed.2016.05.015 [PubMed: 27196141]
- Tidey JW, Cassidy RN, Miller ME, Smith TT. 2016; Behavioral Economic Laboratory Research in Tobacco Regulatory Science. Tobacco Regulatory Science. 2(4):440–451. DOI: 10.18001/TRS.2.4.13 [PubMed: 28580378]
- Ugur ZB. 2015; Does Presumed Consent Save Lives? Evidence from Europe. Health Economics. 24(12):1560–1572. DOI: 10.1002/hec.3111 [PubMed: 25273232]
- Yurasek AM, Dennhardt AA, Murphy JG. 2015; A randomized controlled trial of a behavioral economic intervention for alcohol and marijuana use. Experimental and Clinical Psychopharmacology. 23(5):332–8. DOI: 10.1037/pha0000025 [PubMed: 26191947]