Title

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Journal

Current Opinion in Pediatrics, 34(4)

ISSN

1040-8703

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Publication Date

2022-08-01

DOI

10.1097/mop.0000000000001126

Peer reviewed

HHS Public Access

Author manuscript

Curr Opin Pediatr. Author manuscript; available in PMC 2023 August 01.

Published in final edited form as:

Curr Opin Pediatr. 2022 August 01; 34(4): 326–333. doi:10.1097/MOP.0000000000001126.

Application of behavioral economics for understanding health behaviors among adolescents and young adults

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Abstract

Purpose of Review: Behavioral economics (BE) concepts have become well-studied tools in addressing patient issues, such as weight loss, smoking cessation, and medication adherence. Although predominantly studied in adult populations, emerging literature has shown BE's utility for adolescent/young adult (AYA) populations, offering a practical framework to safeguard AYA health and influence healthy decision making.

Recent Findings: We identified substantive areas in which BE concepts have been applied in AYA populations (e.g., substance use) and outline how these concepts have been used as a tool to identify individuals at risk for poor outcomes and leverage behavioral insights to improve health behaviors.

Summary: BE research holds significant promise as a tool for clinicians and researchers to encourage healthy decision making in AYA populations. Yet there are opportunities for BE research to expand further into current trends impacting adolescent health, such as electronic nicotine delivery systems, social media apps, and COVID-19 vaccinations. Furthermore, the full degree of BE utility remains to be explored, as few studies demonstrate the translation of associative findings into direct interventions. Additional work is needed to formalize BE techniques into best practices that clinicians can implement in their daily practice.

Keywords

adolescents and youth; behavioral economics; health behaviors; substance use; weight and nutrition

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Conflicts of interest

None.

INTRODUCTION

Behavioral economics (BE) melds psychology with economic principles to investigate human behavior, offering a rich set of tools that can be used to understand and influence the daily choices individuals make [1].

In healthcare, patient outcomes are often defined by behavioral choices. Adolescents and young adult (AYA) populations in particular face choices that significantly impact current and future health. During a period of intense physical, emotional, and cognitive changes, AYAs are often exposed to harmful behaviors, such as substance use, unsafe sexual behavior, and nonadherence to medications; vulnerable to "experimentation and psychosocial stressors" [2], they are subject to impulsive decision making that can affect healthy development over the life course [2].

Although many BE concepts have been predominantly studied in adults, emerging literature has shown its utility in AYA and offers a practical framework to influence healthy decision making [3, 4*]. In this review, we introduce common BE concepts, review current BE applications, and discuss current gaps and future areas of application, ultimately to provide guidance on how BE frameworks can be used to leverage behavioral change for AYA in a clinical setting.

BEHAVIORAL ECONOMICS CONCEPTS

BE focuses on uncovering systematic patterns of cognitive biases that influence decision making–many of which have significant implications for health. BE utilizes these biases to enforce subtle changes and encourage healthy behaviors. One example is "ordering effects," which is the tendency to make choices based on order of presentation (e.g., first or last rather than intermediate in a list). For example, in a study on opt-in or opt-out HIV screening, researchers found that making opt-in the default choice improves acceptance for HIV testing [5]. Ordering effects and five other common BE concepts that were most frequently investigated and/or implemented among AYA are outlined (Table 1).

SUBSTANCE USE

AYA face heightened risk for substance use and its associated health effects. Substance use in adolescence carries a high risk of substance use disorders in adulthood and thus, is a critical area for intervention [6].

Delay Discounting

Present bias–also known as delay discounting–is defined as the tendency to prefer smaller, immediate rewards over larger, delayed ones. For substance use, those who engage in delay discounting will strongly rank the immediate pleasure of a cigarette over the delayed, long-term benefits of better health. In fact, high rates of delay discounting are linked to impulsive behavior and used as a marker for substance misuse and addiction, with higher rates of delay discounting strongly associated with AYA heavy smoking [7] and drinking-and-driving behavior [8].

Delay discounting tests–hypothetical tasks where participants choose between either an immediate, small reward or a delayed, larger reward (e.g., would you prefer $95 today or $180 in three months)–can help measure the degree of impulsive behavior and assess feelings of reward that predict future substance behavior. For example, questionnaires that assessed hypothetical choices regarding alcohol and money in college students strongly correlated with real behaviors [9]: college students with greater delayed discounting were found to drink greater amounts. In addition, among adolescent smokers, higher rates of delay discounting predicted poorer outcomes in smoking cessation programs [10].

Delay discounting tasks can be a useful tool to predict and assess future substance use behaviors within clinical practice. Clinicians can incorporate measures such as the well-validated 5-trial adjusting delay discounting task as a screening tool to identify patients who may be prone to risky substance use behavior [11]. Because this tool does not directly assess current behavior, it may be especially useful for pre-emptively identifying risk or in situations where clinicians are concerned about accurate disclosure of behaviors.

Additionally, clinicians can use delay discounting concepts to frame interventional conversations. Clinicians can capitalize on the tendency to be present-biased, focusing on either the immediate benefits of healthy behaviors or risks of unhealthy choices (e.g., young adults exposed to the immediate, negative effects of sun radiation through UV photographs and photo-aging information increased sun protection behaviors [12]). In addition, episodic future thinking (the vivid visualization of positive future events) can directly reduce delay discounting, decrease unhealthy behaviors, and encourage treatment adherence [13]. Such concepts can be subsequently translated to substance use. For example, clinicians who focus on smoking cessation can highlight that lowered blood pressure and increased oxygen levels can occur in as little as an hour of quitting smoking. Additionally, rather than discussions about tobacco's long term health consequences, they can focus on highlighting the compounding short-term cost of cigarettes or future events that they can look forward to instead of smoking (e.g., upcoming graduation, birthday party).

Social Norms and Normative Feedback

Social norms are unwritten rules of behavior that govern our daily interactions (e.g., saying "bless you" when someone sneezes). However, compliance to social norms can also contribute to unhealthy behaviors, as in substance use.

AYA may feel compelled to use substances if they see their peers, friends, or parents doing it. For example, adolescents are more likely to use cannabis if marijuana use was a norm among close friends [14]. With the rise of social media, the impact of social norms has spread easily and broadly, influencing AYA behaviors even if they are outside of their immediate social network, as seen in alcohol-related activity of friends on Facebook escalating future drinking behavior of high school students [15].

Recent research used the comparison of social norms, also known as normative feedback, where individuals are shown if their behavior is aligned with social expectations, to discourage unhealthy behaviors. For example, in a group of youth who were shown feedback comparing their personal alcohol use to their peers, reductions in perceived peer use led to

reductions in drinking [16]. Similar effects were seen in cannabis use, where personalized, normative messaging discouraged cannabis use [17**,18*]. Clinicians can directly apply these study insights to improve their own practice. Within patient visits, clinicians can use comparisons of peer groups to strengthen the effectiveness of interventional conversations, employing county or national peer data (e.g., stating “About 11.3% of boys your age have smoked a cigarette in the last 30 days [19]”) to shift perceived social norms and discourage risky substance use.

Other studies have incorporated the use of social media, including recruiting youth ambassadors to disseminate health-promoting messages through their social media networks [20]. Some have used popular platforms (e.g., YouTube) to test the effect of corrective health messages [21], finding that online messages about smoking’s lack of social acceptability created less favorable attitudes towards smoking and stronger beliefs about smoking’s harm. Additionally, clinicians should be aware of the potential role that social media plays in exposing their patients to harmful social norms and when possible, direct them toward accurate sources of information on peer behaviors.

Alternative Reinforcement

Alternative reinforcement refers to providing alternative activities that influence changes in harmful, existing behavior. For AYA, lower availability of substance-free activities is associated with higher rates of substance use, especially among those with low socioeconomic status and/or lower parental education [22]. Interventions incorporating alternative reinforcement–like substance-free activity and relaxation training–have reduced drinking behavior [23] and increased self-regulation [24].

Joyner *et al.* integrated both risk factors and substance-free activities to investigate the behavior of heavy college drinkers [25] and found that lower availability of substance-free activities was associated with greater alcohol use, and those with a family history of alcohol misuse were more at risk, suggesting that social and familial environments can interact to impact substance use. These results showcase how availability of substance-free activities specifically can be a modifiable protective factor against future alcohol use and also how risk varies depending on dispositional characteristics, such as family history.

With these insights, clinicians can combat substance use through identification and intervention. Specifically, creating prevention efforts that provide enjoyable alternatives, such as social, leisure, or academic activities, may be most effective for reducing the escalation of risky behaviors into substance use disorders. For example, clinicians can use well-validated screening tools such as the HEADSS (Home, Educational, Activities, Drug, Sex, Suicide) assessment to learn about the availability of substance-free activities in their patients’ lives [26]. In addition, clinicians can take initiative in learning about local resources or programs that create sources of alternative reinforcement (e.g., YMCA, Girl Scouts, Big Brothers Big Sisters of America) and provide referrals to a community partner for patients who may be in high-risk environments.

Future Directions

Although there are numerous studies using BE interventions to investigate AYA substance use, there are still gaps. Few studies have explored the rise of electronic nicotine delivery systems among adolescents: whether BE techniques used to influence 'traditional' cigarette behavior can be translated for e-cigarettes or if new interventions using BE devices are needed to combat their use. Although there have been preliminary studies on price sensitivity in JUUL purchasing [27] and social norms influencing e-cigarette use [28], additional work evaluating BE predictors of vaping behavior and BE-based interventions are needed.

WEIGHT AND NUTRITION

Many AYA live in environments that fail to promote optimal nutrition and exercise levels [29]. Such deficiencies are concerning because of their immediate and long-term health consequences, where unhealthy early habits are carried throughout adulthood. Such risk factors, however, are modifiable.

BE interventions surrounding weight and nutrition mostly fall into two types: educational-based, which focus on giving participants a corrective message on behavior, or appeal-based, which focus on the implementation of incentives (monetary or food reward) and framing (losses or gains of a reward or behavior). More success has been achieved with BE interventions that focus on appeal, incentives, and convenience, as compared to interventions that are purely educational [30, 31]. This is seen in the success of appeal-based interventions, such as the use of choice architecture, which nudges consumers to make better choices through intentional design of food presentation [32].

Nudging, Framing, and Nutrition

The way a message is presented can have a large impact on choice. For example, implementing visual cues (e.g., green stickers by healthy food choices and red stickers by unhealthy choices) can "nudge" or subconsciously encourage individuals into healthier choices, with varying effects based on the type of food item [33*]. Other applications have focused on framing, testing whether or not an individual reacts differently based on whether a preventative behavior is associated with a loss or gain of reward [34]. In an experimental setting, both gain (where a prize is given if participants choose fruit) and loss-frame (where a prize is lost if participants choose cookie) incentive methods increased healthy food choices, while educational messaging alone had little to no effect on food choice.

Clinicians can implement these principles to improve nutrition and weight outcomes. For example, clinicians can incorporate framing and personalized goal-making to make AYA feel more motivated reaching nutritional or weight targets or educate parents about simplifying home food choices (e.g., serve vegetables first) [35]. Others can influence local policy, working with hospitals or cafeterias to implement visual cues within menu design (e.g., color coding to mark healthy food choices) or food presentation (e.g., putting healthy items at eye level and unhealthy items lower).

Social Norms and Food Choice

What AYA think their peers choose to eat also influences their food choices. Peer norms significantly impact adolescent food intake, especially when it pertains to peer food consumption and how much adolescents identify with the reference group [36]. An online study tested how perceptions of peer food choices of sugar-sweetened beverages and fruit and vegetable servings affected personal consumption, finding adolescents overwhelmingly misperceived peer food choice behavior and that such misconceptions contributed to unhealthy dietary patterns [37].

Clinicians can thus implement message framing, establishment of healthy peer norms, and appeal-based interventions to nudge youth towards healthier behaviors. For example, clinicians could create stepwise plans with their patients and their families [35], creating rewards with meeting optimal nutrition plans or loss of incentives with unhealthy behaviors. Likewise, they can combat peer and social influences by sharing social norms about peer behavior and connecting adolescents to peer groups to motivate healthy behavior.

HEALTH MAINTENANCE BEHAVIORS

Another application of BE focuses on health maintenance behaviors, ranging from chronic disease management to vaccinations.

Financial Incentives and Chronic Disease Management

Financial incentives refer to monetary forms of reward that motivate individuals to pursue specific behaviors, like medication adherence. Modest financial incentives improved the carrying of epinephrine among AYA with food allergies [38]. Additionally, daily financial incentives improved glucose monitoring adherence for AYA with type 1 diabetes [39].

Nally *et al.* tested the impact of financial incentives on self-management via new insulin pump technology, finding that financial incentives results in lower HbA1c and optimized technology use [40*]. However, the success of financial incentives for AYA also depends on the willingness of parents to use them. The use of cash incentives to motivate adolescent behavior were positively received when the amount was deemed appropriate by parents and their children were fiscally responsible [41], suggesting the need to incorporate both adolescents and parent perspectives in incentive design [42].

Researchers and clinicians should aim to further explore the utility and effectiveness of financial incentives for chronic disease management in AYA populations to determine the degree of its impact.

Cognitive Biases and Vaccination Behavior

Cognitive biases refer to systematic unconscious errors in reasoning that underlie decision making. One example is confirmation bias, a cognitive bias where individuals intentionally search for and interpret new information in order to confirm preexisting beliefs and disregard opposing views (e.g., individuals with anti-vaccination beliefs are more likely to overestimate adverse events following immunization and underestimate severity of vaccine-preventable diseases such as varicella, HPV, and COVID-19 [43**]).

In AYA, researchers have used cognitive biases to investigate and influence the perception, uptake, and completion of vaccinations against *Human papillomavirus* (HPV). One study used the cognitive bias of loss aversion to motivate more youth to finish their vaccine dose series through gain or loss of a cash reward during their vaccination period and stressing loss of reward if vaccination dosages were not completed [44]. Another investigated the cognitive processes in HPV vaccine hesitancy among parents and determined that higher vaccine hesitancy was associated with two biases: confirmation bias (the tendency to accept information that fits one's prior beliefs and reject information that does not) and present bias (the tendency to discount future effects over present benefits) [45].

Such findings are especially relevant during COVID-19, when vaccine hesitancy exists as a barrier to ending the pandemic. Approximately 24% of young adults aged 18–25 years were hesitant to receive a COVID-19 vaccine in a recent national survey [46*], and adolescent attitudes towards COVID-19 vaccines were impacted by parent and peer norms, indicating the urgency for BE-related interventions [47**].

BE concepts such as behavioral nudges and framing methods are being investigated to reduce vaccine hesitancy and promote vaccine uptake [48*]. Behavioral nudges like text-based reminders that promoted importance of, ease of signing up for vaccination, and feelings of ownership significantly increased vaccination appointments and rates [49**]. Studies of framing effects have shown that negative descriptions for vaccines significantly reduced intention to vaccinate [50].

Clinicians can take advantage of BE concepts to reduce vaccine hesitancy and improve compliance with COVID-19 related health mandates. First, clinicians may want to begin discussions with patients by assessing which cognitive biases AYA are incorporating in their decision-making process in order to directly address each bias. Clinicians can further use framing to encourage vaccination uptake, emphasizing losses (e.g., COVID impacts such as lung damage or missed school) or gains (e.g., reduced severity and protection of communities). They can also employ normative feedback and comparison of peer groups to encourage vaccination uptake, such as using county vaccination trackers to show rates among local peer groups (e.g., children within the same age range). In addition, clinicians can also indirectly influence patient and parent behavior through the design of their clinical practice, implementing "nudges" such as text-based reminders or opt-in defaults throughout EMR platforms to increase likelihood of increasing vaccination appointments and uptake.

CONCLUSION

BE research holds significant promise as a tool for clinicians and researchers to encourage healthy decision making among AYA, helping identify individuals at risk, strengthen interventional conversations, and improve health behaviors from nutrition to substance use.

Although the range of existing studies is diverse, gaps remain. BE research needs to expand further into current trends drastically impacting adolescent health, such as electronic nicotine delivery systems, social media apps, and COVID-19 vaccinations. Furthermore, the full degree of BE utility still remains to be explored, as a majority of research has

investigated mechanisms and insights at the research level but fewer studies demonstrate the translation of associative findings into direct interventions. Additional work is needed to formalize BE techniques into best practices that clinicians can implement in their daily practice.

Still, BE has shown its ability to motivate behavioral changes and decision making across a variety of clinical settings and behaviors among AYA. Clinicians can incorporate a range of BE concepts, starting from clinical practice design and policy (e.g., nudging via EMR, choice architecture, default options) to risk identification tools (e.g., assessing delayed discounting or alternative reinforcement) to direct patient interventions (e.g., framing conversations, implementing incentives, program referrals). Incorporating these changes into clinical practice can be a direct step to unlock the full potential of BE in creating healthier lives for adolescents and young adults.

Financial support and sponsorship

We wish to acknowledge the generous funding support provided by the National Institute of Diabetes and Digestive and Kidney Diseases (K01 DK116932-01), and the UCLA Clinical and Translational Science Institute (NIH/NCATS UL1TR001881).

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48 *. Caskey R. Behavioral economics as a model to improve adolescent and adult vaccination. Clin Ther 2021; 43:1649–1653. [PubMed: 34353638] This review details into the history and drivers of vaccine hesitancy, its role during the COVID-19 pandemic among adolescents and adults, and how behavioral economics can be used to overcome cognitive biases and encourage vaccination and better health outcomes.

49 **. Dai H, Saccardo S, Han MA, et al. Behavioural nudges increase COVID-19 vaccinations. Nature. 2021;597(7876):404–409. doi:10.1038/S41586-021-03843-2 [PubMed: 34340242] This paper provides direct evidence of the utility of behavioral nudges in a clinical setting and demonstrates the power of text-based messages in encouraging COVID-19 vaccine uptake and maximizing vaccination appointment compliance among patient populations.

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Key Points

- BE concepts have been used to identify adolescents/young adults (AYA) at risk for certain behaviors and improve health behaviors across three core areas: substance use, nutrition and weight management, and health behaviors.
- Clinicians can incorporate a range of BE concepts, starting from clinical practice design and policy (e.g., nudging via EMR, choice architecture, default options) to risk identification tools (e.g., assessing delayed discounting or alternative reinforcement) to direct patient interventions (e.g., framing conversations, implementing incentives, program referrals).
- BE research needs to expand further into current trends drastically impacting AYA health, such as electronic nicotine delivery systems, social media apps, and COVID-19 vaccinations.
- Furthermore, the full degree of BE utility still remains to be explored, as a majority of research has investigated mechanisms and insights at the research level but fewer studies demonstrate the translation of associative findings into best practices that clinicians can incorporate in routine patient encounters.

Table 1:

Behavioral Economics Common Concepts

Key Term	Definition	Clinical Examples	Additional References
Delay Discounting (Present Bias)	Tendency to discount future effects in comparison with present benefits	Teens tend to think about the immediate pleasure of eating sweet and fatty foods and not think about the long-term consequences of obesity, diabetes, and other health conditions.	Quisenberry *et al.*, 2016[7] Teeters *et al.*, 2015[8] Lemley *et al.*, 2016[9] Harvanko *et al.*, 2019[10] Mahler *et al.*, 2007[12] Scholten *et al.*, 2019[13] Frank *et al.*, 2020[35]
Loss Aversion	Reacting more strongly to losses than comparable gains	Youth are more motivated over the potential loss of $50 for not completing an HPV vaccination than the reward of $50 gained.	List *et al.*, 2015[34] Caskey *et al.*, 2017[44]
Alternative Reinforcement	Providing alternatives to existing, reinforced behavior	Clinicians should examine sources of alternative reinforcement, as adolescents are less likely to engage in substance abuse if they participate in alternative opportunities (school clubs, sports, and volunteering).	Lee *et al.*, 2018[22] Murphy *et al.*, 2019[23] Soltis *et al.*, 2018[24] Joyner *et al.*, 2018[25]
Financial Incentives	Monetary forms of reward that motivate individuals to pursue specific behaviors	Teens with diabetes can be motivated to control their glycemic levels through financial incentives.	Cannuscio *et al.*, 2015[38] Wong *et al.*, 2017[39] Nally *et al.*, 2021[40] Beskin *et al.*, 2019[41] Malik *et al.*, 2020[42] Caskey *et al.*, 2017[44]
Social Norms	Unwritten rules of behavior that are cultural and environmental byproducts of the society or group an individual associates with; can be peer, parental, or societal based	Adolescents' consumption of alcohol is influenced by their perceptions of their peers' behavior.	Blevins *et al.*, 2018[14] Nesi *et al.*, 2017[15] Gersh *et al.*, 2019[16] Donaldson *et al.*, 2021[17] Pischke *et al.*, 2021[18] Evans *et al.*, 2020[20] Romer *et al.*, 2017[21] Stok *et al.*, 2016[36] Perkins *et al.*, 2018[37] Rogers *et al.*, 2021[47]
Nudging	Interventions that focus on appeal and convenience to influence and alter behavior	Putting a fruit item at eye level or near the cash register can get students to consume healthier items.	Gordon *et al.*, 2018[30] Quinn *et al.*, 2018[32] Schindler-Ruwisch *et al.*, 2021[33] List *et al.*, 2015[34] Caskey *et al.*, 2021[48] Dai *et al.*, 2021[49] Strickland *et al.*, 2021[50]