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Undermining Desire: Reducing Unhealthy Choices by Highlighting Short-Term (vs. Long-Term) Costs

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ABSTRACT

What motivates consumers to avoid unhealthy behaviors (e.g., consuming sugar, energy drinks, and fast food)? Traditional interventions and lay intuition suggest that to motivate themselves, consumers can consider the negative long-term health consequences of their decisions. Yet, consumers still struggle to avoid unhealthy behaviors. Seven experiments ($N = 4,021$) offer a different approach. We find that considering short-term costs of unhealthy behaviors (e.g., irritability or indigestion after eating sugar) better curbs these behaviors than considering long-term costs or no costs. We theorize that short-term costs are more effective at reducing unhealthy behavior because they are more strongly associated with the act of consumption, both in terms of immediate timing and perceived likelihood of costs occurring. As such, short-term costs are better at undermining the reason for consuming unhealthily: anticipated enjoyment of the consumption experience. We test this process by (1) demonstrating mediation via increased association strength and subsequent decreased anticipated enjoyment, (2) manipulating the association strength between consumption and costs (i.e., same cost realized sooner vs. later), and (3) demonstrating moderation via consumers' goal for eating unhealthily. These results identify a powerful, but underutilized self-regulation strategy – emphasizing short-term costs of unhealthy consumption – with implications for consumers and marketers.

Keywords: motivation, goals, short-term/long-term costs; self-regulation; choice

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3 Consider two services aimed at helping consumers avoid unhealthy food. The first
4 emphasizes the negative, delayed consequences of eating unhealthily, instructing consumers to
5 “think long-term” and focus on the risks of eating sugar for obesity and diabetes. The second
6 service recommends that consumers instead think “short-term” and focus on how eating sugar
7 can negatively affect them in the present (e.g., cause indigestion and a sugar spike and crash).
8 Which service will be more successful at encouraging consumers to resist a plate of cookies?
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11 This is a \$72 billion dollar question—the estimated value of the US weight-loss market.
12 Consumers spend heavily on products and services to help them avoid delicious, but unhealthy
13 food. Indeed, 63% of US consumers find it important to be able to resist temptations (APA
14 2012). Research has similarly focused on interventions to help consumers say “no” to
15 temptations (e.g., Duckworth and Gross 2014; Mukhopadhyay, Sengupta and Ramanathan 2008;
16 Patrick and Hagtvedt 2012). Unfortunately this is a battle consumers are losing – the desire to eat
17 unhealthily is one of the most prevalent desires consumers face, but also one they are least
18 successful at resisting (Hofmann, Vohs, and Baumeister, 2012), with energy intake from ultra-
19 processed foods and foods with added sugars constituting a major proportion of calories
20 consumed in the US (Steele et al. 2016).
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40 Traditional approaches follow the strategy of the first company, encouraging consumers
41 to avoid unhealthy foods by focusing on long-term costs (Baumeister et al. 1998; Metcalfe and
42 Mischel 1999). But might the strategy of the second company be more effective? Long-term
43 outcomes are not always motivating (Woolley and Fishbach 2016), in part because they are
44 discounted relative to more immediate outcomes (Ainslie 1975; Bartels and Urminsky 2011;
45 Urminsky and Zauberman 2015). Whereas consumers may recognize the importance of avoiding
46 long-term costs, delicious cookies are hard to resist in the moment (Karniol and Ross 1996).
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3 Similarly, self-control strategies such as will-power and situation selection can sometimes
4 prevent consumers from engaging in unhealthy behaviors, but are fallible and challenging to
5 utilize (Ludwig, Brown and Brewer 2020). Finally, consumers may vary in their own conviction
6 to health goals, rendering long-term appeals less persuasive.
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11 We propose an alternative strategy: highlighting *short-term* costs of unhealthy behaviors.
12 We suggest that the structure of temptations – immediate gratification at long term cost – has led
13 people to underappreciate the short-term costs such behaviors also carry. Short-term costs refer
14 to the relatively mild consequences that are more directly associated with consumption: they
15 arrive minutes and hours following unhealthy consumption and are perceived as more likely to
16 occur, compared with long-term costs, which are more severe, experienced months and years
17 later, and are perceived as less likely to occur. For example, beyond long-term health costs,
18 eating dietary sugar confers negative costs soon after consumption (e.g., upset stomach, sugar
19 crash) as does eating food high in fat and sodium (e.g., bloating).
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33 In examining whether consumers can harness short-term costs to reduce unhealthy
34 behaviors, this research provides theoretical and substantive contributions to the literature on
35 behavior change, goal pursuit, and intertemporal choice. First, this strategy for curbing unhealthy
36 behavior directly targets and undermines the desire to eat unhealthily independent of the long-
37 term goal. As such, by emphasizing short-term costs inherent in unhealthy behaviors, the present
38 approach reduces the need for effortful self-control, strong long-term health goals, or proactive
39 situation selection strategies to resist temptation.
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49 Second, this research advances literature on goal pursuit and intertemporal choice by
50 identifying consequences of short-term *costs* for motivation. Prior research found that providing
51 immediate benefits increases healthy behavior (Milkman, Minson and Volpp 2014; Shiota et al.
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2021; Woolley and Fishbach 2016), framing benefits as immediate reduces unhealthy behavior (Gerend and Cullen 2008), and adding immediate rewards fosters intrinsic motivation (Kruglanski et al. 2018). We contribute by investigating the motivating properties of immediate costs, finding that such costs curb unhealthy behavior by undermining their intrinsic appeal.

Third, our research expands understanding for *why* short-term costs are more effective at undermining unhealthy behaviors. In doing so, we contribute to research that has begun to examine the effectiveness of short-term costs (e.g., for reducing smoking, Pechmann 1997; Smith and Stutts 2003; and drinking, Gerend and Cullen 2008). We are the first to systematically document the benefits of highlighting short-term (vs. long-term) costs across a variety of consumption domains, and to provide a theoretical explanation of why such costs are effective. We propose that short-term costs are more strongly associated with the act of unhealthy consumption, and thus better able to undermine the primary reason for unhealthy consumption: anticipated enjoyment of the consumption experience. In doing so, we also offer theoretical contributions to research on strength of association (or “fusion”) between actions and ends (Kruglanski et al. 2018) by investigating the interrelated antecedents of fusion.

Beyond these theoretical advancements, a key contribution of our research is in offering substantive insights for consumers’ own self-regulation and a robust tool for marketers of health products and services aimed at helping consumers achieve their health goals. We lay out a model for when and why certain interventions are more (vs. less) likely to be successful, offering a toolkit for policy makers to apply these insights more broadly.

THEORETICAL DEVELOPMENT

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3 Deciding whether or not to eat unhealthily, like whether to eat cookies or order fast food,
4 is a common choice consumers face. And while having sugary snacks once in a while or eating a
5 burger every now and then is not problematic, over time such behaviors can have negative
6 consequences for individuals' long-term well-being (Duckworth and Gross 2014; Hoch and
7 Loewenstein 1991). Despite long-term costs, consumers are often tempted by, and succumb to,
8 such temptations (Metcalf and Mischel 1999; Myrseth, Fishbach and Trope 2009).
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11 The prevalence, difficulty, and importance of reducing unhealthy behavior has led
12 researchers and practitioners to produce several classes of strategies to help consumers. As the
13 decision to engage in unhealthy behavior is often framed as a dual-motive conflict pitting
14 immediate gratification against long-term goals (Fujita 2011; Vosgerau, Scopelliti and Huh
15 2020), some strategies focus on effortfully or proactively resisting temptation, whereas others
16 operate by highlighting the importance of the long-term goal. What these strategies have in
17 common is that they take the strength of the desire to consume unhealthily for granted. By
18 overlooking the malleability of anticipated enjoyment of unhealthy behavior (i.e., strength of the
19 desire to eat unhealthily), we propose that these strategies miss an important component of why
20 people eat unhealthily in the first place, and thus miss an opportunity to curb unhealthy behavior.
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42 Effortful and Proactive Strategies 43 44 45 46

47 One approach to reduce unhealthy behavior is to draw on will-power (Baumeister et al.
48 1998; Metcalf and Mischel 1999). Consumers can try to resist eating cookies despite their
49 desirability. However, willpower requires the ability and motivation to resist such urges, and
50 may not always be effective (Fujita et al. 2020; Galla and Duckworth 2015).
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3 Another approach involves the removal or development of habits to circumvent
4 unhealthy behavior. Choice architecture, situation selection, and precommitment work by
5 restricting accessibility of unhealthy foods (e.g., not keeping candy at home; Duckworth,
6 Gendler and Gross 2016; Johnson et al. 2012; Schwartz et al. 2014; Wertebroch 1998). Indeed,
7 people high in self-control are more likely to hold strong habits for healthy activities, like sleep
8 and work (Carden and Wood 2018) and less likely to hold habits for unhealthy activities, like
9 eating junk food (Adriaanse et al. 2014). Despite the strength of such strategies, situational
10 changes and habit formation require that consumers are committed to the goal, able to change
11 their surroundings to align with those goals, and have the self-awareness to do so (Sayette et al.
12 2008). Further, establishing healthy habits (and breaking unhealthy ones) requires time and
13 energy (Wood and Neal 2016), making it difficult to follow through on. Even consumers with
14 good habits and/or those who have structured their environment to facilitate their goals will
15 inevitably be confronted with temptation at times, and as such cannot rely solely on these
16 proactive approaches.
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38 Long-Term Goal Focused Strategies

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42 Another class of strategies for reducing unhealthy behavior focuses on one side of the
43 dual-motive conflict: long-term consequences. Bolstering the long-term goal and/or reminding
44 people of long-term costs, the argument goes, can strengthen long-term motives, helping people
45 overcome the desire to eat unhealthily. For instance, when people feel closer to their future self,
46 it is easier to resist eating unhealthily because long-term outcomes are more vivid, which
47 strengthens the motivational force of long-term health goals (Rutchick et al. 2018).
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3 Relatedly, taking a distanced perspective, as when considering a choice in a year (vs.
4 tomorrow), reduces the appeal of unhealthy options by promoting thoughts consistent with
5 higher-order goals (Fujita et al. 2006; Torelli and Kaikati 2009). Adopting a distanced
6 perspective (high-level construal) operates by expanding people's regulatory scope, such that
7 they construe unhealthy food through the lens of long-term health goals (Trope et al. 2021). In a
8 similar vein, people can take a long-term view by grouping multiple decisions together, which
9 helps people resist temptations (Myrseth et al. 2009; Rachlin 2000; Read, Loewenstein and
10 Rabin 1999). Notably, these effects are related in that they require that people value the long-
11 term goal to be healthy in the first place.
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24 Other interventions similarly operate by drawing attention to long-term advantages of
25 resisting unhealthy behaviors, such as reaffirming long-term goals (Bandura 1989; Kuhl 1984),
26 or long-term drawbacks of engaging in unhealthy behaviors, such as by increasing vividness of
27 these behaviors' long-term costs (e.g., obesity, tooth-decay; Donnelly et al. 2018; VanEpps and
28 Roberto 2016). The latter practices are frequently used by policy makers—for instance, by
29 displaying graphic warning labels that both grab attention and highlight long-term costs of
30 temptations (e.g., Loewenstein et al. 2001; Peters, Lipkus and Diefenbach 2006).
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40 Research on attitude change has similarly examined how fear campaigns, which highlight
41 the severity and probability of an event, can help people refrain from unhealthy behaviors (e.g.,
42 PPM, Rogers 1975; Maddux and Rogers 1983; EPPM, Witte 1992). This prior research assumes
43 an additive relationship between these factors, whereas we propose that short-term costs (i.e., a
44 less severe threat that is more likely to occur) will be more effective than long-term costs (i.e., a
45 more severe threat that is less likely to occur). Additionally, fear appeals have well-documented
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3 drawbacks, such as disordered eating (Lapinski 2006) or disengagement, as consumers may
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5 instead tune the message out (Hastings, Stead and Webb 2004).
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8 Other strategies operate by harnessing psychological pain associated with acting contrary
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10 to long-term goals (e.g., remorse; Giner-Sorolla 2001; Ramanathan and Williams 2007). For
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12 example, a dieter may feel guilty after eating a cookie, motivating him to avoid cookies (Duke
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14 and Amir 2019; Hoch and Loewenstein 1991; Loewenstein and O'Donoghue 2006). Such
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16 appeals can be effective, but have similar drawbacks to fear appeals (Patrick, Chun and Macinnis
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18 2009). They can also prompt reactance (Coulter, Cotte and Moore 1999), rationalization (Khan
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20 and Dhar 2006; Okada 2005), or even harmful behavior (e.g., for weight loss; Xu and Guo
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22 2018). Further, guilt reactions may again only be effective if they boost the importance of long-
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24 term goals (Hofmann and Fisher 2012).
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29 The aforementioned strategies emphasize the centrality of long-term thinking in both
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31 theoretical and applied approaches to curbing unhealthy behavior. Yet a challenge with
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33 emphasizing long-term costs is that consumers heavily discount delayed outcomes relative to
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35 immediate considerations (Ainslie 1975; Chapman 1996; O'Donoghue and Rabin 1999;
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37 Urminsky and Zauberger 2015). As such, long-term costs are likely to have their impact
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39 blunted. Indeed, graphic warnings labels (Donnelly et al. 2018) and vividness of the future self
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41 (Hershfield and Bartels 2018) may be effective in part by making future outcomes more pressing
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43 in the present. Additionally, a prerequisite for these strategies is that people value the long-term
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45 goal (e.g., to lose weight), yet consumers vary greatly in their convictions to their long-term
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47 goals (NPD Group 2020). This suggests that to combat unhealthy behaviors, approaches that rely
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49 on long-term thinking may not be sufficient.
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A Solution: Short-Term Cost Focused Strategies

Rather than emphasize long-term costs to reduce unhealthy behaviors, we instead focus on the opposite side of the dual-motive conflict: reducing the appeal of unhealthy behaviors by highlighting their short-term costs. We propose that short-term costs are more effective at reducing unhealthy behaviors than are long-term costs because short-term costs are more strongly associated with unhealthy consumption.

The idea that short-term costs may be more effective than long-term costs is supported by research on health message framing. For example, highlighting the short-term, social costs of smoking (e.g., bad breath, cosmetic costs) can be more effective at reducing adolescents' smoking behavior than highlighting the long-term costs (e.g., cancer; Pechmann 1997; Peracchio and Luna 1998; Smith and Stutts 2003). Adolescents often smoke for social approval; possibly, short-term costs reduce smoking for this population by undermining the reason for engaging in the behavior in the first place. Similarly, considering short-term (vs. long-term) costs of alcohol consumption can reduce drinking (Bernstein, Wood and Erickson 2016), though results are mixed (Gerend and Cullen 2008).

Research on mindfulness similarly hints at the effectiveness of short-term costs. Smokers who practiced mindfulness while smoking became aware of the unpleasant taste and smell of smoking, leading to cessation (Brewer and Pbert 2015). In the words of one participant, "Mindful smoking: smells like stinky cheese and tastes like chemicals. YUCK" (Brewer 2019). Intriguingly, this suggests that sensitizing people to the short-term costs of unhealthy behavior may dampen their allure, potentially precluding the need for effortful inhibition, situation selection, or strategies that reinforce long-term goals. This tactic – undermining the

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3 attractiveness of unhealthy consumption – is not without precedent: research on counteractive
4 self-control has found that those with good self-control spontaneously devalue the appeal of
5 unhealthy behaviors (Myrseth et al. 2009; Trope and Fishbach 2000). For example, to resist
6 cookies, people with a stronger dieting goal construed cookies as more caloric when cookies
7 were (vs. were not) available (Zhang, Huang and Broniarczyk 2010; see also, Trudel and Murray
8 2011). Notably, however, like the long-term focused strategies previously reviewed,
9 counteractive control requires that people value the long-term goal to operate (Hoch and
10 Loewenstein 1991; Myrseth et al. 2009; Trudel and Murray 2011), and is primarily found in those
11 with good self-control. Might highlighting short-term (vs. long-term) costs lead people to
12 devalue unhealthy behavior, independent of holding a long-term health goal?
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26 Addressing this question, we examine when and why short-term costs are more
27 motivating than long-term costs across multiple consumption domains. Whereas short-term costs
28 are generally more mild than long-term costs, there is a more direct and immediate causal
29 mapping between the act of engaging in unhealthy behaviors and the realization of short-term
30 costs, thus making the two actions (consumption and costs) more strongly associated. This
31 stronger association, in turn, makes short-term costs more influential in consumers' evaluation of
32 the act of consumption, thereby undermining the attractiveness of unhealthy behaviors.
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45 Undermining the Appeal of Unhealthy Behavior Via Strongly Associated Costs 46 47 48

49 Research has highlighted the central importance of association strength between actions
50 and outcomes (i.e., means and ends) for motivation. Typically, research focused on the
51 association between an action and a *positive* outcome. For instance, immediacy between means
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3 and ends results in a strong association between the two (i.e., means-end fusion; Kruglanski et al.
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5 2018; Woolley and Fishbach 2023), which increases engagement when the ends are rewarding
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7 (e.g., tastiness of healthy food; Woolley and Fishbach 2018; exercising with an audiobook or
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9 friend, Milkman et al. 2014; Gershon, Cryder and Milkman 2020). Association strength increases
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11 motivation by causing positive features of the outcome (i.e., enjoyment) to transfer over to the
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13 means of pursuit, imbuing the means with positive affect (Fishbach, Shah and Kruglanski 2004).
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17 We investigate the motivational properties of strongly associated costs (as opposed to
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19 rewards). We suggest that short-term costs are more strongly associated with the act of unhealthy
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21 consumption in at least two interrelated ways.¹ First, short-term costs are more temporally
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23 proximal – they are realized sooner following consumption relative to long-term costs. Second,
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25 short-term costs are perceived as occurring with greater likelihood, and their likelihood of
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27 occurring is more contingent on eating unhealthily. Eating an unhealthy snack increases the
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29 perceived likelihood of experiencing short-term costs in a way that does not occur with long-
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31 term costs (i.e., “I won’t get diabetes, and even if I do it won’t be because of this donut”).
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35 We thus propose that (relatively mild) short-term costs are experienced (1) sooner and (2)
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37 with greater likelihood, which makes them more strongly associated with unhealthy behavior.
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39 We focus on short-term costs inherent in unhealthy consumption, which typically manifest as
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41 physical discomforts (e.g., indigestion, poor sleep) or consequences to one’s mood, focus, or
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43 energy (e.g., due to a sugar spike and crash). Importantly, they do not require connection to the
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53 ¹ Like many phenomena, strength of association is likely multiply determined (e.g., Pham 2013). We focus on two
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55 drivers, timing and likelihood, because they are supported in the literature as potential predictors of association
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57 strength (e.g., timing: Woolley and Fishbach 2018; likelihood: Allen and Janiszewski 1989) and because a pilot test
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59 delineating how consumers distinguish between short-term (vs. long-term) costs of consuming dietary sugar
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revealed the prominence of these two factors (see pilot study in Web Appendix B).

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3 long-term goal to arise (i.e., self-conscious emotions of guilt and regret, which arise from
4 perceived goal failure, e.g., Giner-Sorolla 2001, fall outside this definition of short-term costs).
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8 Drawing on research on affect transfer (Fishbach et al. 2004; Kruglanski et al. 2002,
9 2018) and stimulus-response theories (Razran 1954; Thorndike 1932), which are central to the
10 principles of conditioning (e.g., Allen and Janiszewski 1989; De Houwer, Thomas and Baeyens
11 2001), we propose that when costs are more strongly associated with unhealthy behavior, the
12 unpleasantness associated with costs becomes more integrally connected to unhealthy
13 consumption, causing people to have a more negative evaluation of unhealthy consumption.
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15 Whereas eating unhealthily is typically viewed as an enjoyable experience consumers *want* to
16 engage in, the negative affect of mild but strongly associated short-term costs, relative to more
17 severe, but weakly associated long-term costs, is more likely to transfer to the act of eating
18 unhealthily, undermining engagement in unhealthy behaviors. Indeed, akin to research on
19 “healthy satiation,” which finds that people with strong (vs. poor) self-control experience a
20 greater decline in enjoyment when consuming unhealthy (vs. healthy) food (Redden and Haws
21 2013), we suggest that short-term costs can reduce enjoyment of unhealthy food. In this way, we
22 believe short-term costs will lead people to devalue unhealthy behaviors in a manner similar to
23 counteractive control, but via a different mechanism: strongly associated costs, a mechanism that
24 requires neither a strongly held health goal, nor above-average self-control ability.
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45 Overall, since immediate factors play a critical role in consumption decisions,
46 undermining the appeal of unhealthy behaviors by highlighting strongly associated short-term
47 costs may represent a powerful opportunity for encouraging behavior change, even amongst
48 those not strongly committed to health goals. We thus test if highlighting short-term costs (e.g.,
49 through a public service announcement [PSA]) can prospectively reduce anticipated enjoyment
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3 and subsequent choice of unhealthy options even before consumption, thereby making them an
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5 effective proactive intervention tool.
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10 RESEARCH OVERVIEW

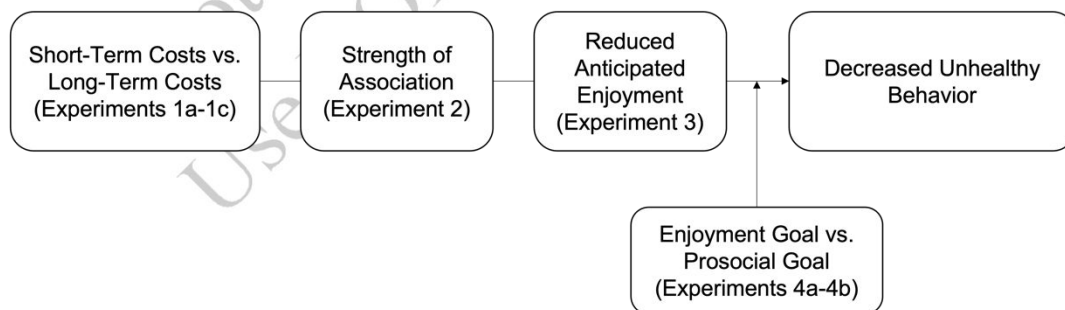
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15 Seven experiments ($N = 4,021$) tested our predictions. First, three incentive-compatible
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17 experiments found that consumers avoid unhealthy foods and drinks (cookies, energy drinks, and
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19 fast food) more when focusing on short-term costs relative to long-term costs (experiments 1a-
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21 1c) or no costs (experiment 1a). Supplemental study 1 replicated these findings in the domain of
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23 alcohol (see Web Appendix C). We propose that this effect occurs because short-term costs are
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25 both (a) realized sooner and (b) more likely to occur compared to long-term costs, which in turn
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27 jointly inform how associated these costs are with unhealthy consumption. We tested this process
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29 in two ways: Experiment 2 measured association strength directly, revealing that the effect of
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31 cost consideration on interest in unhealthy food is mediated by a stronger association.
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34 Experiment 3 manipulated strength of association directly by holding the costs of consuming
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36 sugar constant (i.e., indigestion) and showing that costs that arrive relatively sooner (vs. later)
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38 reduce interest in a sugary snack. Because short-term costs are tightly associated with the act of
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40 consumption, we expect negative affect from considering short-term costs to color evaluations of
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42 unhealthy consumption; indeed Experiment 3 further found that this effect is mediated by
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44 reduced anticipated enjoyment of unhealthy food.
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49 Experiments 4a-4b tested for moderation – that short-term costs curb unhealthy behavior
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51 by undermining anticipated enjoyment. Consumers may choose to avoid engaging in unhealthy
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53 behavior, even if they anticipate enjoying it, for a number of reasons (e.g., because of the long-
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term consequences it might produce) – in other words, while enjoyment is one input into the choice of whether or not to eat unhealthily, it is not the only consideration. Experiments 4a-4b provide evidence that short-term costs reduce anticipated enjoyment by demonstrating that short-term costs undermine intentions to purchase sugary snacks when consumers hold an enjoyment goal, but that this attenuates when enjoyment is not a primary motivator for consumption (i.e., when purchasing candy or cookies for a charity fundraiser). Across all experiments, we confirmed that these findings are robust to individual differences (BMI, age, gender, health goal strength, and perceived self-control ability; see Web Appendix E).

Finally, we suggest that there is heterogeneity in the extent to which consumers naturally associate unhealthy behaviors with short-term (vs. long-term) costs. We tested this in our Coda analysis and in supplemental study 2, which measured actual engagement in unhealthy behaviors (drinking alcohol, eating sugar, eating fatty foods). We found that perceiving these unhealthy behaviors as having short-term costs predicted avoidance, with no effect for long-term costs. Figure 1 depicts how our experiments map onto our full theoretical model. Table 1 contains a summary of each experiment's main findings.

FIGURE 1: THEORETICAL MODEL



Note. Figure 1 depicts how our experiments map onto our theoretical model. Note that short-term costs differ from long-term costs in that they are more immediate, perceived as more likely to occur, and less severe. Strength of association refers to perceived overlap between the act of unhealthy consumption and experiencing the consequences of unhealthy consumption.

TABLE 1. SUMMARY OF EXPERIMENTS

Experiment (<i>n</i>)	Finding
*1a (450)	Short-term (vs. long-term or no) costs decrease choice of cookies in an incentive-compatible design.
*1b (217)	Short-term (vs. long-term) costs decrease choice of energy drink in a real environment setting.
*1c (302)	Using a single claim, short-term (vs. long-term) costs decrease choice of a gift card to a fast food restaurant.
*2 (801)	Short-term (vs. long-term) costs decrease interest in eating a sugary snack, as these costs are more strongly associated with the act of consumption.
*3 (750)	Holding costs of eating donuts constant, costs framed as more (vs. less) associated with donut consumption (indigestion that day vs. the next morning) decrease interest in eating donuts, which is mediated by reduced anticipated enjoyment of consuming donuts.
*4a (497) and 4b (1,004)	Moderation by goal: Short-term (vs. long-term) costs of eating sugar decrease cookie/candy purchase intentions when motivated by enjoyment, which attenuates when motivated by prosociality. This is mediated by reduced anticipated enjoyment of consuming cookies/candy.
Supplemental Study 1 (451)	Short-term (vs. long-term or no) costs decrease interest in drinking alcohol at a bar.
Supplemental Study 2 (502)	The belief that consuming sugar, fat, and alcohol has short-term costs predicts actual avoidance of these behaviors more strongly than believing them to have long-term costs.

* Denotes pre-registered at aspredicted.com. Supplemental studies 1-2 are reported in the Web Appendix C-D.

To ensure sufficient power to reliably detect effects in our experiments (Brysbaert 2019), we pre-determined all sample sizes a priori and no participants were added following initial collection and analysis. Based on pilot testing our manipulations, we recruited $n = 100-150$ per cell (prior to pre-registered exclusions) when testing for a main effect (experiments 1a-1c) and $n = 250$ when testing moderation (experiments 4a-4b). For experiments 2-3, which tested complex mediation models and a conservative manipulation of costs (respectively) we recruited $n = 375-400$ per cell, as we suspected these models would require more data. We pre-registered these sample sizes in all experiments except experiment 4b. Data, syntax, materials, and pre-registrations are available at OSF: [bit.ly/3tmJrA3](https://osf.io/3tmJrA3). We report the effect sizes d and r for the relationship between our cost consideration manipulation and preference for unhealthy options to facilitate comparisons between our experiments and effect sizes reported in meta-analyses of health messages (Gallagher and Updegraff 2012; Shen, Sheer and Li 2015).

EXPERIMENT 1A: HIGHLIGHTING SHORT-TERM (VS. LONG-TERM OR NO) COSTS OF COOKIES

In experiment 1a, we examined how considering short-term, long-term, or no costs of eating sugar influenced choice of cookies in an incentive compatible design. We expected that participants considering the short-term costs of consuming sugar would be less likely to choose a delivery of cookies (vs. a tote bag) compared with those considering the long-term costs of consuming sugar, or those not considering any costs of consuming sugar.

Method

We pre-registered this experiment (aspredicted.org/LZJ_SAB) and recruited 450 participants from Prolific ($M_{\text{age}} = 33.28$, $SD = 12.40$; 52.2% female; $M_{\text{BMI}} = 26.40$). We randomly assigned participants to one of three conditions (cost consideration: short-term vs. long-term vs. control) in a between-subjects design.

Participants learned that they would make a choice between two different lotteries. One lottery was for a delivery of 24 cookies from Sucre Patisserie (\$32 value) and the other was for an LL Bean tote bag (\$32 value). Participants learned that one participant would be chosen at random and have their choice delivered within four days. In the control condition, participants made their lottery choice without reading additional information. In the two critical conditions, participants read additional information before making their choice. In the *Long-Term Costs* condition, participants read:

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3 Although you may prefer the cookie delivery, you know that eating sugary foods will
4 have negative consequences in the long-run: if you eat many sugary baked goods, you'll
5 increase your risk for diabetes, heart disease, and obesity. You're also worried about the
6 long-term effects of sugar on oral health, and you know sugar consumption can lead to
7 mental health issues later on.
8
9

10 In the *Short-Term Costs* condition, participants instead read:

11
12 Although you may prefer the cookie delivery, you know that eating sugary foods will
13 have immediate negative consequences: if you eat many sugary baked goods, you'll end
14 up feeling jittery and unable to concentrate the rest of the day. Sugar also upsets your
15 stomach, makes you feel blah right after eating it, and affects your mood, making you
16 more stressed out and more easily angry/upset.
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19 Participants then viewed images of the two prizes (see Figure S5 in Web Appendix F for
20 stimuli) and made their choice. At the end of the experiment, we asked participants if they had a
21 food restriction preventing them from eating cookies. We measured BMI, strength of health goal,
22 and self-control. We tested for interactions between our cost consideration manipulation and
23 these individual difference measures (for all experiments that assessed them) as well as gender
24 and age. We found no consistent interactions and our effects hold when controlling for these
25 covariates (see Web Appendix E).
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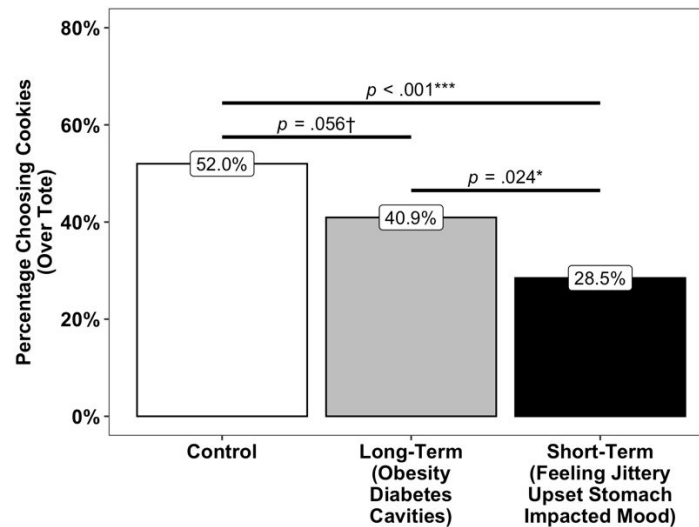
38 Results and Discussion

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42 We conducted a logistic regression of lottery choice on two dummy variables
43 representing the long-term costs and control conditions, with the short-term costs condition as
44 the reference group. In line with our prediction, significantly fewer participants selected the
45 cookies when focusing on short-term costs (28.5%) compared with long-term costs (40.9%; $b =$
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115 .55, SE = .25, Wald = 5.10, $p = .024$, $OR = 1.74$, $d = .31$, $r = .15$) and compared with the no cost
116 control condition (52.0%, $b = 1.00$, SE = .24, Wald = 16.92, $p < .001$, $OR = 2.72$, $d = .55$, $r =$

.27; Figure 2). The long-term costs condition had a marginally lower choice share of cookies compared to the control condition ($b = .45$, $SE = .23$, $Wald = 3.66$, $p = .056$, $OR = 1.56$, $d = .25$, $r = .12$).²

FIGURE 2: EFFECT OF COST CONSIDERATION ON CHOICE OF COOKIES



Note. * $p < .05$; *** $p < .001$.

Experiment 1a demonstrated that highlighting short-term costs of dietary sugar made participants 30% less likely to choose cookies relative to highlighting long-term costs, and 45% less likely compared to not highlighting any costs. Since the cookie delivery would arrive four days after their choice, this finding suggests the effect is due to the consideration of costs rather than the experience of costs in the moments after choice.

Although focusing on short-term costs reduces cookie choice relative to focusing on long-term costs, consumers do not appear to realize that doing so will help them avoid unhealthy foods. In a post-test, we asked participants ($n = 98$) how they motivate themselves to avoid

² A total of 5.3% ($n = 24$) of participants reported having a food restriction preventing them from eating cookies. We find a similar pattern of results when controlling for food restrictions (short-term vs. long-term: $b = .54$, $SE = .25$, $p = .028$; short-term vs. control: $b = .99$, $SE = .24$, $p < .001$; long-term vs. control: $b = .44$, $SE = .23$, $p = .058$). When we exclude these participants, we find a similar pattern of results (short-term vs. long-term: $b = .47$, $SE = .25$, $p = .059$; short-term vs. control: $b = .87$, $SE = .25$, $p < .001$; long-term vs. control: $b = .40$, $SE = .24$, $p = .096$).

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3 consuming food with added sugar (open-ended response). Half of participants referenced
4 focusing on long-term costs (e.g., thinking about obesity and cavities resulting from sugar
5 consumption). Others (33%) mentioned precommitment strategies, such as keeping sugar out of
6 the house. Only 7% referenced short-term strategies (such as thinking about a sugar crash or
7 upset stomach resulting from unhealthy consumption). In a second post-test, we asked
8 participants ($n = 106$) the same question, and gave them two response options, “I try and focus
9 on the long-term negative consequences of eating added sugar” or “I try and focus on the short-
10 term negative consequences of eating added sugar.” Participants were twice as likely to indicate
11 that they focus on the long-term costs (67%) than short-term costs (33%; $p < .001$). Thus, even
12 though short-term costs help decrease choice of cookies relative to long-term costs, consumers
13 do not appear to use this as a strategy to avoid unhealthy foods.
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31 **EXPERIMENT 1B: HIGHLIGHTING SHORT-TERM (VS. LONG-TERM) COSTS OF** 32 **ENERGY DRINKS** 33 34 35 36 37

38 We conducted experiment 1b in a real environment (where choices were immediately
39 realized). University students viewed a PSA about the consequences of energy drinks inspired by
40 real-world examples emphasizing costs of unhealthy behaviors (see Figures S1-S4 in Web
41 Appendix A). We expected that participants viewing a PSA emphasizing the short-term (vs.
42 long-term) costs of energy drinks would be less likely to choose a free energy drink over a free
43 face mask.
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54 Method
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5 We pre-registered this experiment (aspredicted.org/7BZ_F5L) and recruited 217
6 university students in an atrium at a large university ($M_{\text{age}} = 24.84$, $SD = 4.59$; 50.2% female).
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10 Participants first learned that they would be viewing an infographic and answering a few
11 questions. They also learned that they would be making a choice between two options, and that
12 they would receive the option they chose at the end of the experiment. We then randomly
13 assigned participants to one of two conditions (cost consideration: short-term vs. long-term) in a
14 between-subjects design.
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17 Depending on condition, participants viewed one of two PSAs about the consequences of
18 consuming energy drinks, pre-tested to confirm we successfully manipulated the perceived onset
19 of costs (see Figure S6 in Web Appendix F for stimuli and pre-test results).
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22 In the *Long-Term Costs* condition, the PSA highlighted costs of energy drink
23 consumption for long-term health (i.e., consequences for increased blood pressure, diabetes, and
24 obesity). In the *Short-Term Costs* condition, the PSA described costs of energy drink
25 consumption for one's immediate experience (i.e., consequences for heart palpitations, anxiety,
26 and sugar and caffeine crash). After reading their assigned PSA, participants chose between two
27 options, a red cloth face mask or an energy drink (see Figure S7 in Web Appendix F). All
28 participants received the outcome they selected.
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47 Results and Discussion

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3 In line with our prediction, fewer participants chose an energy drink over a face mask in
4 the short-term costs condition (46.4%) versus the long-term costs condition (61.7%; $\chi^2(1, N =$
5 $217) = 5.12, p = .024, \phi = .15, d = .34, r = .15$).
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10 Experiment 1b thus demonstrated that considering short-term (vs. long-term) costs of
11 consuming energy drinks decreased choice of an energy drink product, and extended experiment
12 1a by showing that our effects also occur when choices are realized immediately.
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19 **EXPERIMENT 1C: SINGLE SHORT-TERM (VS. LONG-TERM) COST OF FAST** 20 **FOOD**

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26 Experiment 1c extended experiments 1a-1b in two ways. First, we tested our prediction in
27 a new domain: fast food consumption. Second, we examined whether this effect appears when
28 considering a single claim, asking participants to consider either a single short-term (bloating) or
29 long-term (high blood pressure) cost. We expected that learning about a single short-term cost of
30 fast food would decrease interest in eating unhealthily (operationalized as choice of a gift card to
31 a fast-food restaurant) relative to learning about a single long-term cost of eating fast food.
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42 **Method**

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47 We pre-registered this experiment (aspredicted.org/WXD_CXN) and recruited 304
48 participants from MTurk. We excluded participants who failed an attention check ($n = 2$) leaving
49 302 participants ($M_{\text{age}} = 43.14, SD = 13.58; 58.3\% \text{ female}; M_{\text{BMI}} = 27.17$).
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We randomly assigned participants to one of two conditions (cost consideration: short-term vs. long-term) in a between-subjects design. Depending on condition, participants viewed one of two infographics with information about consequences of consuming fast food (see Figure S8 in Web Appendix F). In the *Long-Term Cost* condition, the infographic emphasized how consuming fast food causes high blood pressure. In the *Short-Term Cost* condition, the infographic emphasized how consuming fast food causes stomach bloating. Information in these infographics was adapted from real infographics with single health claims (Figures S1-S4 in Web Appendix A), as well as popular press articles emphasizing costs of eating junk food (McCarriston 2020; NewYork-Presbyterian 2018).

After viewing this information, participants were offered a chance to win a \$25 gift card to either their choice of fast-food restaurant or their choice of Apple App or Google Play Store. Participants made their choice and then answered an attention check question.

Results and Discussion

As predicted, fewer participants chose a gift card from a fast-food restaurant after viewing an infographic that highlighted a single short-term (vs. long-term) cost of consuming fast food ($M_{\text{short-term}} = 42.1\%$; $M_{\text{long-term}} = 58.0\%$; $\chi^2(1, N = 302) = 7.63, p = .006, \phi = .16, d = .35, r = .16$).

Experiment 1c thus demonstrated that focusing on a single short-term (vs. long-term) cost reduced choice share of an unhealthy option. Together with experiments 1a-1b, we find that a focus on short-term (vs. long-term) costs of consuming high sugar or high fat foods reduced choice of these unhealthy options. Supplemental study 1, described in Web Appendix C,

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3 additionally replicated the effectiveness of short-term (vs. long-term or no) costs in the domain
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5 of alcohol consumption.
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8 **EXPERIMENT 2: SHORT-TERM (VS. LONG-TERM) COSTS ARE MORE**
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10 **STRONGLY ASSOCIATED WITH EATING A SUGARY SNACK**
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15 Experiment 2 sought to provide evidence for our underlying process. We propose that
16 highlighting short-term costs is effective for reducing unhealthy behavior because such costs are
17 more strongly associated with unhealthy consumption. To test this, we measured association
18 strength directly via an overlapping circles paradigm (Woolley and Fishbach 2018). We
19 predicted that the effect of short-term (vs. long-term) costs on decreased interest in unhealthy
20 food would be mediated by a stronger association between the act of consumption and
21 experiencing the consequences. In particular, we predicted that short-term costs are more
22 effective at undermining unhealthy behavior in part because they are both (a) realized sooner and
23 (b) perceived as more likely to occur compared to long-term costs, which in turn jointly inform
24 how associated these costs are with unhealthy consumption.
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40 Method
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45 We pre-registered this experiment (aspredicted.org/1D7_QDJ) and recruited 801
46 participants from Prolific ($M_{\text{age}} = 33.89$, $SD = 13.02$; 47.6% female, $M_{\text{BMI}} = 26.58$). We
47 randomly assigned participants to one of two conditions (short-term vs. long-term costs).
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51 Participants assigned to the *Long-Term Costs* condition read “Although [sugary baked
52 goods and drinks] are tasty, you know that eating sugary foods might have negative health
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3 consequences in the long-run, such as increased risk for diabetes, heart disease, and obesity.
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5 Sugar might also have detrimental effects on oral health (cavities).” Participants assigned to the
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7 *Short-Term Costs* condition read, “Although [sugary baked goods and drinks] are tasty, they
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9 might leave you feeling jittery and unable to concentrate on work the rest of the day due to the
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11 sugar spike and crash. Sugar also might upset your stomach (making you feel blah soon after
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13 eating it), and/or affect your mood (making you more stressed out and more easily angry/upset).”
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17 Participants indicated how likely they were to eat a sugary snack later that afternoon (1 =
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19 not at all likely, 7 = very likely). We then measured perceived timing of costs, “If you have a
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21 sugary snack this afternoon, are these consequences something you would experience
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23 immediately or something you would experience in the distant future?” (1 = distant future; 7 =
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25 immediately) and perceived likelihood of costs occurring (two-item scale; $r = .76$), “How likely
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27 are you to experience these consequences?” and “How certain are you that you will experience
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29 these consequences?” (1 = not at all; 7 = extremely). We counterbalanced the order of timing and
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31 likelihood measures ($r = .37$).
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36 To measure perceived overlap between eating a sugary snack and experiencing these
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38 costs, we adapted a measure of association strength from prior research (Woolley and Fishbach
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40 2018). Specifically, we created seven pairs of circles that overlapped to different degrees, from
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42 completely separate (coded as 1) to almost completely overlapping (coded as 7, see Figure S9 in
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44 Web Appendix F). One set of circles represented eating a sugary snack and the other set of
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46 circles represented experiencing (short-term or long-term) costs.
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51 Results and Discussion

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Participants prompted to consider short-term costs of consuming sugar were significantly less interested in eating a sugary snack later that day ($M = 3.41$, $SD = 1.70$) compared to participants considering long-term costs of consuming sugar ($M = 4.04$, $SD = 1.79$, $t(799) = 5.16$, $p < .001$, $d = .36$, $r = .18$).

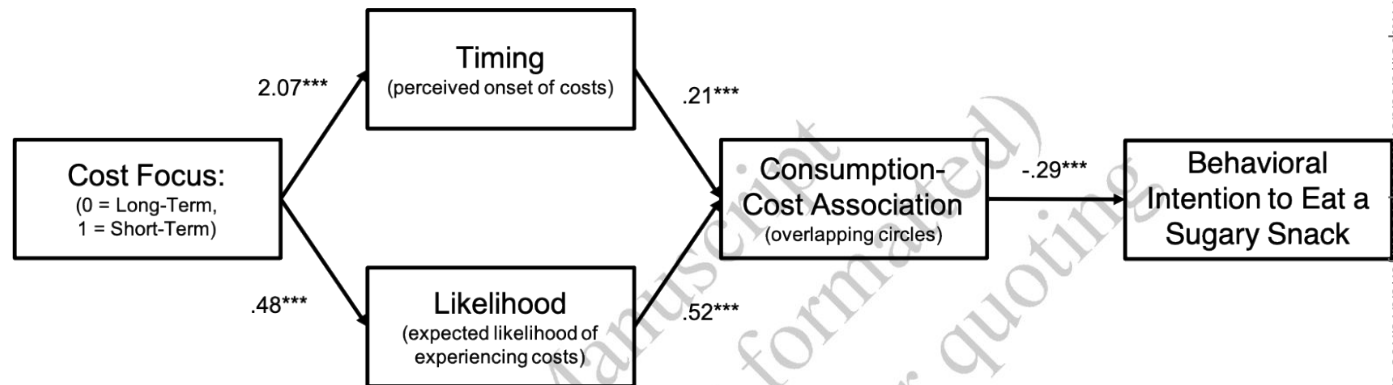
Our manipulation further shifted our mediator variables of interest, such that compared to long-term costs, short-term costs were perceived as more immediate ($M_{\text{short-term}} = 4.32$, $SD = 1.58$, $M_{\text{long-term}} = 2.25$, $SD = 1.33$; $t(799) = 20.11$, $p < .001$, $d = 1.42$, $r = .58$) and more likely ($M_{\text{short-term}} = 5.04$, $SD = 1.76$, $M_{\text{long-term}} = 4.56$, $SD = 1.59$; $t(799) = 4.06$, $p < .001$, $d = .29$, $r = .14$). More importantly, we found the effect of our manipulation on our strength of association measure, such that people perceived greater overlap between unhealthy consumption and experiencing short-term costs ($M = 4.17$, $SD = 1.63$) than long-term costs ($M = 3.53$, $SD = 1.50$; $t(799) = 5.75$, $p < .001$, $d = .41$, $r = .20$).³

We tested our proposed process using parallel and serial mediation (PROCESS Model 80; Hayes 2018 pp. 180-183). As shown in Figure 3, we examined whether our manipulation of short-term versus long-term costs (IV) leads to increased timing (M1a) and likelihood (M1b) of costs occurring, which in turn predict strength of association (M2), which in turn predicts behavioral intentions to consume a sugary snack (DV). Model 80 has been previously used in the literature (Lisjak and Ordabayeva 2022; Pfattheicher et al. 2021; Santana and Morwitz 2021) and is ideal for our purposes as it allows us to examine the independent influence of timing and perceived likelihood (our two M1 mediators) on association strength (our M2 mediator) and on

³ To address the possibility that measuring perceived likelihood and timing of costs occurring before measuring strength of association influenced participants' responses on the strength of association measure, we conducted a pre-registered replication (aspredicted.org/7SQ_DZY). In this replication, we only measured strength of association and behavioral intentions (i.e., not timing or perceived likelihood). We again found a significant effect on association strength ($M_{\text{short-term}} = 4.50$, $SD = 1.66$, $M_{\text{long-term}} = 4.03$, $SD = 1.45$; $t(349) = 2.82$, $p = .005$, $d = .30$, $r = .15$), behavioral intentions ($M_{\text{short-term}} = 3.35$, $SD = 1.63$; $M_{\text{long-term}} = 3.98$, $SD = 1.69$, $t(349) = 3.54$, $p < .001$, $d = .38$, $r = .19$), and mediation through association strength ($b_{\text{indirect}} = -.12$, $SE = .05$, 95% CI = [-.24, -.03]).

the behavioral intention to have a sugary snack (our primary outcome variable).⁴ As predicted, we find a significant indirect effect through both timing ($b_{\text{indirect}} = -.13$, $SE = .03$, 95% CI = [-.20, -.07]), and perceived likelihood ($b_{\text{indirect}} = -.07$, $SE = .02$, 95% CI = [-.12, -.03]).⁵

FIGURE 3. ASSOCIATION STRENGTH MEDIATES THE EFFECT OF COST CONSIDERATION ON INTENTIONS TO EAT SUGAR



Note. Parallel and serial mediation model (based on Hayes PROCESS Model 80); unstandardized beta-coefficients are reported; ** $p < .01$; *** $p < .001$.

Overall, compared to long-term costs, short-term costs are more strongly associated (i.e., overlapping) with the act of unhealthy consumption. We find that association strength is jointly determined, in part, by perceptions of (1) being closer in time and (2) being more likely to occur. This study focused on the two drivers of timing and likelihood because these are supported in the literature as important determinants of association strength (Allen and Janiszewski 1989; Woolley and Fishbach 2018). However, we note that there are likely other drives of association

⁴ We had pre-registered two sequential mediation models (PROCESS model 6), one examining timing and one examining likelihood as M1. These models produce significant indirect effects (timing: $b_{\text{indirect}} = -.23$, $SE = .05$, 95% CI = [-.33, -.15]; likelihood: $b_{\text{indirect}} = -.09$, $SE = .03$, 95% CI = [-.15, -.04]), but Model 80 has the advantage of controlling for one M1 when testing the effect of the other M1. To further examine the robustness of our proposed model, we report additional mediation analyses in the Web Appendix G.

⁵ Whereas likelihood is a stronger predictor of association than timing (likelihood: $r = .63$; timing: $r = .43$), our manipulation more strongly shifts timing than likelihood (timing: $d = 1.40$; likelihood: $d = .29$). When comparing the size of the indirect effects, timing ($b_{\text{indirect}} = -.13$) was marginally stronger than likelihood ($b_{\text{indirect}} = -.07$; $b_{\text{difference}} = -.05$, $SE = .03$, $p = .088$, 95% CI = [-.12, .00]).

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3 strength as well, including those tested in the pilot study reported in Web Appendix B (e.g.,
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5 typicality; ease of imagining experiencing the consequence).
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11 **EXPERIMENT 3: MANIPULATING IMMEDIACY HOLDING COSTS CONSTANT**

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15 We propose that short-term (vs. long-term) costs are more effective at decreasing
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17 unhealthy consumption due to differences in the association strength between consumption of
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19 unhealthy foods and their consequences. However, it is possible that other idiosyncratic
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21 differences in costs unrelated to association strength (e.g., novelty) explain our effect. As a
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23 conservative test of our hypothesis, Experiment 3 manipulated association strength directly by
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25 shifting how immediately costs are realized, holding the costs themselves constant.
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29 Specifically, we framed costs of eating a donut – indigestion from consuming sugar and
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31 fat – as arriving relatively earlier or later (i.e., that day vs. the next morning). If shifting *when*
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33 costs are realized is sufficient to produce our effect, this would provide evidence that a stronger
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35 association between eating unhealthily and experiencing costs decreases unhealthy behavior. We
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37 thus predicted that consumers would be less interested in consuming a donut that was described
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39 as resulting in indigestion later that day versus the following day.
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43 Lastly, we examined the mechanism for why costs that are more strongly associated with
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45 eating unhealthily are more effective at reducing interest in unhealthy foods. We propose that a
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47 strong association leads the unpleasantness associated with costs to become more integrally
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49 connected to eating unhealthily, reducing anticipated enjoyment of consumption. Overall, we
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51 predicted that when indigestion from eating donuts occurs that day (vs. the next), people would
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53 be less interested in eating donuts because they anticipate the donuts are less enjoyable.
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Method

We pre-registered this experiment (aspredicted.org/W61_DPR) and recruited 750 participants from Prolific ($M_{\text{age}} = 37.25$, $SD = 13.18$; 50.0% female, $M_{\text{BMI}} = 26.80$).

Participants imagined that a co-worker brought donuts from a local bakery to the morning team meeting. They read that the donuts were known to be tasty, but high in fat and sugar. We randomly assigned participants to one of two conditions (short-term cost onset: immediate vs. delayed) in a between-subjects design. Participants read about indigestion resulting from consuming the donuts, which we framed as either arriving relatively more immediately or after a delay. Specifically, in the *Immediate* condition, participants read “the last time you ate [these donuts], you immediately had an upset stomach and indigestion within an hour of consuming them.” In the *Delayed* condition, participants read “the last time you ate [these donuts], you later had an upset stomach and indigestion the morning after consuming them.”

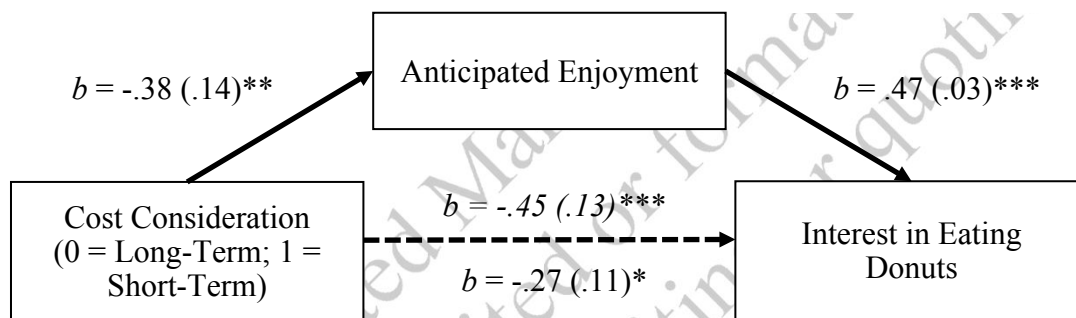
Participants then answered how likely they were to consume the donuts (1 = not at all likely, 7 = very likely) and their anticipated enjoyment of eating the donuts (1 = would not enjoy at all, 7 = would enjoy very much). The correlation between these two measures was $r = .52$.⁶

Results and Discussion

⁶ Experiments 3-4b measured likelihood of engaging in unhealthy behavior and anticipated enjoyment. The correlation between these measures ranged from $r = .39$ to $r = .54$, meaning that anticipated enjoyment accounted for only 15-29% of the variance in likelihood to eat unhealthily.

Participants were less interested in eating donuts when the cost of consuming them were immediate ($M_{\text{immediate}} = 2.58$, $SD = 1.68$) than when they were delayed ($M_{\text{delayed}} = 3.03$, $SD = 1.88$; $t(748) = 3.44$, $p < .001$, $d = .25$, $r = .12$). Moreover, immediate (vs. delayed) costs lowered anticipated enjoyment ($M_{\text{immediate}} = 4.29$, $SD = 2.03$; $M_{\text{delayed}} = 4.68$, $SD = 1.91$; $t(748) = 2.67$, $p = .008$, $d = .20$, $r = .13$), which in turn mediated the effect of cost consideration on interest in eating donuts ($b_{\text{indirect}} = -.18$, $SE = .07$, $95\% \text{ CI} = [-.31, -.04]$; Figure 4).⁷

FIGURE 4: ANTICIPATED ENJOYMENT MEDIATES THE EFFECT OF COST CONSIDERATION ON INTENTIONS TO EAT DONUTS



Note. * $p < .05$; ** $p < .01$; *** $p < .001$.

Experiment 3 provided a conservative test of our hypothesis. A simple shift in the timing of costs reduced interest in eating donuts by 17%. Indeed, this conservative manipulation led to a smaller effect size than that observed in our other experiments. This is perhaps unsurprising given the relatively smaller difference in strength of association between a cost arriving today versus tomorrow (compared with the manipulation of short-term versus long-term cost used in all other experiments). In other words, whereas short-term costs are more strongly associated

⁷ We ran this experiment on a Friday. Possibly, indigestion on a Friday is worse than indigestion on a Saturday. To address this, we ran a pre-registered replication (aspredicted.org/9PC_MW2) on a Tuesday, which found a significant effect on reduced intentions to eat donuts ($M_{\text{immediate}} = 2.52$, $SD = 1.63$; $M_{\text{delayed}} = 2.84$, $SD = 1.68$; $t(748) = 2.66$, $p = .008$, $d = .19$, $r = .10$). We also assessed believability of costs, asking participants "Do you think it is possible for someone to experience indigestion [immediately after eating / the morning after eating] donuts?" Costs were similarly believable in the short-term condition (91%) as in the long-term condition (88%). We present experiment 3 in the main text as it also measured anticipated enjoyment.

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3 with the act of eating unhealthily than long-term costs, the difference in strength of association
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5 for today versus tomorrow morning is much smaller.
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8 Furthermore, in addition to shifting onset of costs, this manipulation may also shift
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10 likelihood, given that the causal mapping from eating donuts to indigestion is more direct when
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12 indigestion occurs immediately versus the next day. As experiment 2 demonstrated, these two
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14 concepts are highly interrelated, and it is not our goal to say timing is exclusively driving these
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16 effects. Rather, we propose that a stronger association between consumption and costs
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18 (informed, in part, by timing and likelihood), rather than other idiosyncratic differences in the
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20 costs, plays a central role in discouraging consumers from eating unhealthy foods. These results
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22 also suggest that more strongly associated costs undermine interest in unhealthy food by
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24 decreasing anticipated enjoyment of eating unhealthily.
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31 **EXPERIMENTS 4A-4B: MODERATION BY ENJOYMENT (VS. CHARITY) GOAL**

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35 So far, we find that emphasizing short-term costs is more effective for curbing unhealthy
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37 behaviors than emphasizing long-term costs or no costs. This effect occurs because short-term
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39 costs are more strongly associated with the act of consumption. Experiment 3 suggested that this
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41 may be because short-term costs reduce the anticipated enjoyment of unhealthy consumption.
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43 Experiments 4a-4b provide additional evidence for this account: specifically, if our effects are
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45 operating through anticipated enjoyment, then we would only predict short-term costs to be
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47 effective when anticipated enjoyment is a primary motivator for unhealthy consumption. While
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49 enjoyment is often a central motivator, in certain situations these concerns can be secondary,
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51 such as when making unhealthy choices to benefit charity. Experiments 4a-4b measured (4a) or
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3 manipulated (4b) participants' goal when deciding whether to purchase Girl Scout cookies (4a)
4 or candy bars from a child (4b). We predicted that highlighting short-term costs would reduce
5 anticipated enjoyment, but that this should only reduce likelihood of purchasing unhealthy food
6 when anticipated enjoyment was primary relative to goals of supporting the child's fundraiser.
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8 We thus investigated (a) whether anticipated enjoyment mediates our effect and (b) whether the
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Experiment 4a Method

We pre-registered this study (aspredicted.org/XQW_S2R) and recruited 506 participants from MTurk. We excluded participants who failed an attention check ($n = 9$) leaving 497 participants ($M_{\text{age}} = 40.80$, $SD = 13.18$; 51.3% female; $M_{\text{BMI}} = 26.78$).

We randomly assigned participants to one of two conditions in a 2 (cost consideration: short-term vs. long-term) between-subjects design. We recruited participants in Spring when Girl Scouts in the US sell cookies, and asked participants to consider being approached by a middle-school age child selling Girl Scout cookies. We framed the decision as a purchase to ensure that our effect occurs even when unhealthy food is not free, generalizing beyond experiments 1-3. Because accessibility of tempting foods increases their consumption (e.g., Baskin et al. 2016; Liu et al. 2014), increasing purchase likelihood should generally lead to increased consumption.

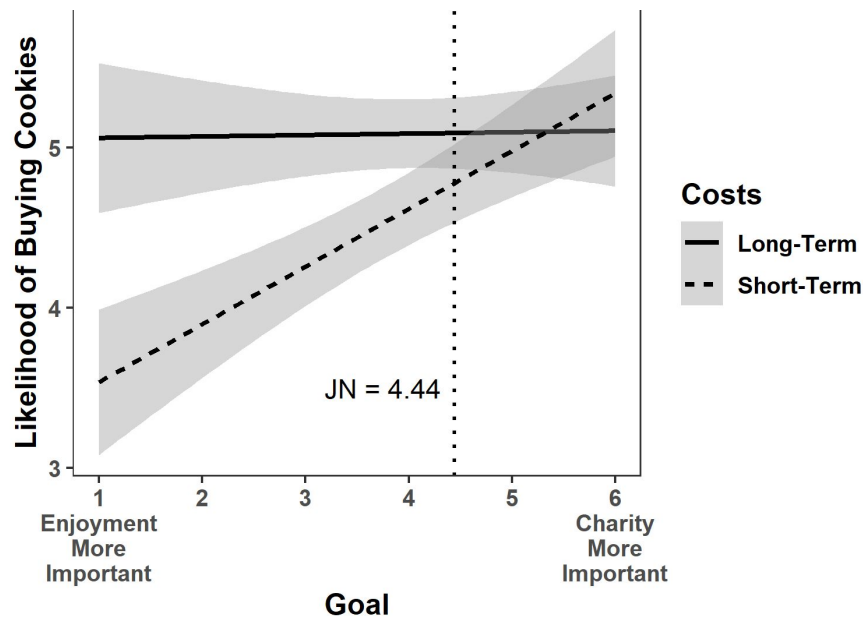
Participants read about either the short-term or long-term costs of eating cookies as a function of condition (similar to experiment 2). We asked participants "How likely are you to buy cookies from this child to enjoy?" (1 = not at all likely, 7 = very likely) and measured anticipated enjoyment: "How much do you think you would enjoy eating the cookies?" (1 =

would not enjoy at all, 7 = would enjoy very much). The correlation between these measures was $r = .54$. Lastly, we measured our proposed moderator, goal consideration, “When you were deciding whether or not to buy cookies from the child, what goal was more important to you?” on a six-item scale (we counterbalanced and recoded endpoints such that 1 = taste/enjoyability much more important and 6 = supporting the child much more important; $M = 3.89$).

Experiment 4a Results

A linear regression of cost consideration (1 = short-term, -1 = long-term) \times individual difference in goal consideration (mean centered) on purchase intentions revealed the predicted interaction ($b = .17$, $SE = .05$, $t(493) = 3.38$, $p < .001$; Figure 5). Decomposing this interaction revealed that the effect of our cost consideration manipulation was stronger the more participants held an enjoyment goal ($-1SD$: $b = -.53$, $SE = .11$, $t = 4.70$, $p < .001$), and significantly attenuated the more participants held a goal to support the child ($+1SD$: $b = .01$, $SE = .11$, $t = .08$, $p = .940$).

FIGURE 5: PURCHASE GOAL MODERATES THE EFFECT OF COST CONSIDERATION ON INTEREST IN BUYING COOKIES



Note. The vertical dotted line marks the Johnson-Neyman (JN) point at which the simple effect becomes statistically significant (i.e., $p < .05$) when $JN \leq 4.44$. Shaded areas correspond to 95% confidence intervals.

We next analyzed our proposed mediator, anticipated enjoyment. We conducted a linear regression of cost consideration \times individual difference in goal consideration (mean centered) on anticipated enjoyment. Those in the short-term cost condition were significantly less likely to anticipate enjoying the cookies ($M_{\text{short-term}} = 5.21$, $SD = 1.64$; $M_{\text{long-term}} = 6.02$, $SD = 1.28$; $b = -.41$, $SE = .07$, $t(493) = -6.26$, $p < .001$). There was no significant effect of goal consideration ($b = -.05$, $SE = .04$, $t(493) = -1.29$, $p = .198$) and a marginally significant interaction ($b = .08$, $SE = .04$, $t = 1.88$, $p = .060$). In line with our proposed process, a moderated mediation analysis revealed a significant index of moderated mediation ($b_{\text{index}} = .07$, $SE = .03$, 95% CI = [.03, .13]; PROCESS model 14). Anticipated enjoyment more strongly mediated the effect of short term (vs. long-term) cost consideration on purchase intention when people more strongly held an enjoyment goal ($-1SD$: $b = -.66$, $SE = .11$, 95% CI = [-.88, -.45]) compared with when people more strongly held a goal to support the child ($+1SD$: $b = -.43$, $SE = .09$, 95% CI = [-.61, -.27]).

Experiment 4b Method

We recruited 1,004 participants from Prolific ($M_{\text{age}} = 32.62$, $SD = 11.84$; 52% female; $BMI = 25.83$) and randomly assigned them to one of four conditions in a 2 (cost consideration: short-term vs. long-term) \times 2 (purchase goal: enjoyment vs. charity) between-subjects design.

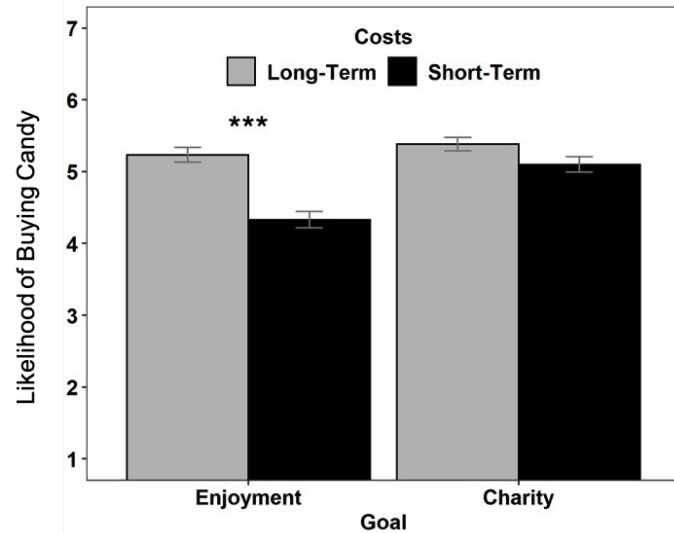
Participants considered buying candy from a middle-school aged child. Participants in the *Enjoyment-Goal* condition read “You find the candy they are selling tasty.” Participants in the *Charity-Goal* condition read “You want to support the cause.” Participants viewed an image of a child holding a sign that said, “Candy bar for \$1.” Participants read about either the short-term or long-term costs of eating candy as a function of condition (similar to experiments 2 and 4a). We measured likelihood of buying candy and anticipated enjoyment as in experiment 4a ($r = .39$).

Experiment 4b Results

An ANOVA of cost consideration \times purchase goal on candy bar purchase intention revealed a significant interaction ($F(1, 1000) = 8.77$, $p = .003$, $\eta_p^2 = .01$; Figure 6). Participants assigned an enjoyment goal were less interested in buying candy when focusing on short-term (vs. long-term) costs ($M_{\text{short-term}} = 4.33$, $SD = 1.85$; $M_{\text{long-term}} = 5.24$, $SD = 1.58$; $F(1, 1000) = 36.97$, $p < .001$, $\eta_p^2 = .04$, $r = .25$, $d = .52$), which significantly attenuated for those assigned a charity goal ($M_{\text{short-term}} = 5.10$, $SD = 1.64$; $M_{\text{long-term}} = 5.38$, $SD = 1.54$; $F(1, 1000) = 3.64$, $p = .057$, $\eta_p^2 < .01$). Decomposing the interaction an alternative way, emphasizing short-term costs reduced candy purchase intentions when people have a goal to enjoy themselves (vs. support the cause; $F(1, 1000) = 27.05$, $p < .001$, $\eta_p^2 = .03$), whereas emphasizing long-term costs had no

significant effect on purchase intentions regardless of goal condition ($F(1, 1000) = 1.00, p = .319, \eta_p^2 < .01$).

FIGURE 6: PURCHASE GOAL MODERATES THE EFFECT OF COST CONSIDERATION ON CANDY PURCHASE INTENTIONS



Note. *** $p < .001$. Bars indicate standard errors.

Moving to anticipated enjoyment, an ANOVA of cost consideration \times goal condition revealed a main effect of cost consideration as in experiment 4a. Focusing on short-term (vs. long-term) costs decreased anticipated enjoyment of eating candy ($M_{\text{short-term}} = 4.31, SD = 1.86$; $M_{\text{long-term}} = 5.19, SD = 1.68$; $F(1, 1000) = 67.69, p < .001, \eta_p^2 = .06$). There was a significant effect of goal condition ($M_{\text{enjoy}} = 4.98, SD = 1.76$; $M_{\text{charity}} = 4.52, SD = 1.86$; $F(1, 1000) = 21.45, p < .001, \eta_p^2 = .02$) and no significant interaction ($F(1, 1000) = .85, p = .356, \eta_p^2 < .01$), such that in both goal conditions, short-term (vs. long-term) costs decreased anticipated enjoyment.

Similar to experiment 4a, a moderated mediation analysis revealed a significant index of moderated mediation ($b_{\text{index}} = .19, SE = .06, 95\% CI = [.08, .32]$; PROCESS model 14).

Anticipated enjoyment more strongly mediated the effect of short term (vs. long-term) costs on

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3 purchase intention when the goal was to enjoy oneself ($b = -.42$, $SE = .07$, $95\% CI = [-.57, -.29]$)
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5 than when the goal was to support a fundraiser ($b = -.23$, $SE = .05$, $95\% CI = [-.33, -.15]$).
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10 Discussion of Experiments 4a-4b

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15 Together, experiments 4a-4b provide evidence for our proposed mechanism: we again
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17 find that the effect of short-term costs is mediated by anticipated enjoyment, and that this effect
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19 is moderated by goal type such that it attenuates when unhealthy purchase intentions are not
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21 driven by enjoyment. This occurred when measuring the goal (experiment 4a) and when
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23 manipulating the goal (experiment 4b).
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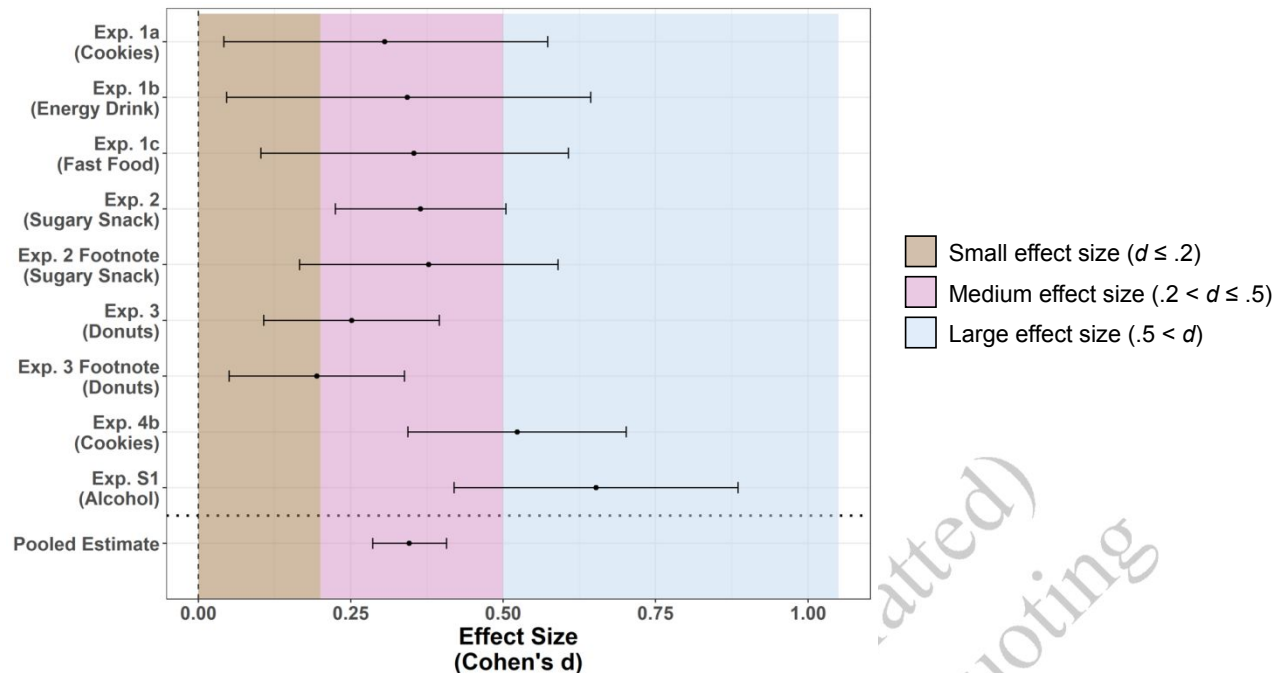
26
27 Possibly, participants holding a charity goal were less affected by our manipulation
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29 because they felt more licensed to purchase candy than those in the enjoyment goal condition.
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31 Against this account, however, we found that short-term costs *reduced* purchase intentions when
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33 holding a goal to enjoy oneself, rather than short-term costs increasing purchase intentions when
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35 holding a goal to support charity (i.e., the interaction was driven by short-term costs *decreasing*
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37 purchase intentions in the enjoyment condition). Further, if these effects were driven by people
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39 feeling licensed to buy candy when holding a charity goal, that would predict an even stronger
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41 relationship between anticipated enjoyment and eating candy in that condition. Instead, we find
42
43 the reverse; our moderated mediation results revealed that anticipated enjoyment had a weaker
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45 effect on predicting candy purchase intentions in the charity (vs. enjoyment) goal condition.
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51 **CODA: IMPLICATIONS TRANSLATED AND BELIEFS ABOUT SHORT-TERM (VS.** 52 53 **LONG-TERM) COSTS OF UNHEALTHY CONSUMPTION** 54 55 56 57 58 59 60

Implications Translated

What do these effects mean for policy and population health behaviors? Figure 7 provides a summary of our effect sizes across studies, as well as a pooled estimate aggregating across studies: $d = .35$, $r = .17$. Adopting our proposed intervention and highlighting short-term costs over long-term costs has the potential to translate to meaningful real-world reductions in disease and mortality. For instance, past research found that when highlighting long-term costs of sugar consumption [text-warning-label intervention], 21.0% of beverage sales in a hospital cafeteria came from the sale of sugar-sweetened beverages (Donnelly et al. 2018). If we assume that our effect in the field is even half as strong as we estimate here (i.e., $d = .17$, $r = .09$), this would correspond to a decrease in consumption of sugar sweetened beverages from 21.0% (using long-term costs) to 16.26% (using short-term costs), meaning a 22.56% decrease in consumption of sugar-sweetened beverages.

FIGURE 7: POOLED EFFECT SIZE ESTIMATE ACROSS EXPERIMENTS



Note. Pooled effect size estimate across experiments (pooled estimate: $d = .35$, $r = .17$). Dots represent effect size (Cohen's d); horizontal lines represent 95% confidence intervals around effect sizes.

This analysis is particularly striking because epidemiological research suggests linear relationships between sugar consumption and negative health outcomes, such that one additional sugar-sweetened beverage per day corresponds to a 12% increase in risk for obesity, a 19% increase in risk for type 2 diabetes, a 10% increase in risk of hypertension, and a 6% increase in all-cause mortality (Qin et al. 2020). Put differently, if public health interventions targeting sugar sweetened beverages were to switch their long-term cost message to a short-term cost message, we could expect approximately 4.74% fewer people selecting daily sugary beverages, which has the potential to reduce obesity, diabetes, hypertension, and all-cause mortality by .57%, .90%, .47%, and .28% (respectively). In other words, if these manipulations were carried out consistently for 100,000 people, this would correspond to 280 fewer instances of all-cause mortality. We note that these analyses are only as sensitive as the assumptions baked into them, and future research is needed to document true effect sizes in the field. However, our initial

evidence suggests that, despite modest effect sizes in our experiments, the present intervention could stand to have a substantial positive influence on population health. Indeed, many behavioral and biomedical interventions with small effect sizes are nonetheless of consequence for public health (Rosenthal and Rosnow 2008; p. 327).

Beliefs about Short-term (vs. Long-term) Costs of Unhealthy Consumption

In experiments 1c, 3, and 4b, after assessing our primary measures, we assessed participants' beliefs about short-term costs (e.g., in experiment 4b: "Eating candy has immediate consequences") and long-term costs (e.g., "Eating candy has long-term consequences") from (1) strongly disagree to (7) strongly agree. These measures allowed us to test our hypothesis that individual variability in perceived short-term costs of unhealthy behavior is a stronger predictor of reduced behavioral intentions than perceived long-term costs of unhealthy behavior. Although we expect and find that participants associate unhealthy consumption *more* with long-term than with short-term costs (see Table S1 in Web Appendix H), we expected that beliefs about short-term costs would be more predictive of preferences than beliefs about long-term costs.

To test this hypothesis, we predicted choice of a fast food gift card (experiment 1c), interest in eating donuts (experiment 3), and candy purchase intentions (experiment 4b) from beliefs about short-term costs and long-term costs of these unhealthy behaviors (simultaneously) using a logistic (experiment 1c) or linear (experiments 3 and 4b) regression. For each, short-term costs were significantly negatively related to unhealthy behavior ($ps < .001$, see Web Appendix H for full statistics), but long-term costs were not significantly related to unhealthy behavior ($ps > .388$). Comparing the strength of these estimates, we find that short-term beliefs were

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3 significantly or marginally more predictive of avoiding unhealthy behavior than long-term
4 beliefs ($ps < .07$).
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8 These data thus provide convergent evidence both that perceptions of short-term costs are
9 more predictive of participants' desire to avoid unhealthy options compared to long-term costs,
10 and that long-term costs are not consistently related to participants' intentions or choices. In
11 combination with our experimental data, these data suggest that beliefs about short-term costs of
12 unhealthy behavior are more influential than beliefs about long-term costs. However, given we
13 assessed these measures after our manipulation of short-term versus long-term costs, to further
14 investigate this effect, and to explore this within the context of consumers' real behavior, we
15 conducted supplemental study 2 ($n = 502$; reported in Web Appendix D). Here we measured
16 participants' actual frequency of engaging in three different unhealthy behaviors during a typical
17 week (number of alcoholic drinks, sugary snacks, and junk food consumed), as well as their
18 beliefs about the short-term and long-term costs of each of those behaviors.
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33 Replicating the above analyses, this time predicting actual unhealthy behavior, the more
34 participants believed that an unhealthy behavior carried short-term costs, the less they engaged in
35 it ($b = -.11$, $SE = .02$, $t(1406.21) = -7.81$, $p < .001$). However, the more participants believed that
36 an unhealthy behavior carried long-term costs, the *more* they engaged in it ($b = .10$, $SE = .02$,
37 $t(1359.40) = 4.69$, $p < .001$). Though unexpected, this might reflect the fact that consumers who
38 routinely engage in unhealthy behavior are more acutely aware of the possible negative
39 consequences they may face later. Across both short-term and long-term beliefs, there were no
40 interactions with behavior type ($ps > .210$), suggesting a similar pattern of results for alcoholic
41 drinks, sugary snacks, and junk food. In these data, then, only beliefs about short-term costs had
42 a tempering relationship on unhealthy consumption.
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GENERAL DISCUSSION

This research demonstrates a new approach for curbing unhealthy behaviors: highlighting short-term (vs. long-term) costs of unhealthy consumption. Short-term costs were more effective than long-term costs at reducing interest in unhealthy behaviors ranging from consuming sugar, energy drinks, fast food, and alcohol (experiments 1a-1c, supplemental study 1). An intervention highlighting short-term costs was also more effective relative to no explicit focus, suggesting our results are not due to long-term costs backfiring.

Emphasizing short-term costs reduces unhealthy behavior because these costs are more strongly associated with the act of consumption, which in turn leads the unpleasantness associated with these costs to become more integrated into people's representation of unhealthy consumption, such that people anticipate unhealthy behaviors to be less enjoyable. We demonstrate this process using both mediation and moderation approaches. First, experiment 2 found that short-term (vs. long-term) cost consideration increases the association strength between consumption and costs, which is jointly determined (in part) by the temporal onset of costs and perceived likelihood of costs occurring. Second, experiment 3 found that holding the consequence itself constant, framing the consequence as more associated with unhealthy behavior (i.e., arriving more immediately) reduces anticipated enjoyment of unhealthy behaviors, which subsequently mediated a decrease in consumption. Thus, we find that emphasizing short-term costs more effectively reduces unhealthy consumption by changing how enjoyable consumers anticipate the experience of unhealthy consumption to be. Experiments 4a-4b provide further evidence of this process by demonstrating that when consumers consider purchasing

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3 unhealthy snacks for reasons other than enjoyment, short-term costs are less effective at reducing
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5 unhealthy behavior.
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8 Beyond manipulating people's focus on short-term (vs. long-term) costs, the additional
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10 analysis reported in the Coda and supplemental study 2 demonstrate that individual differences
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12 in the extent to which people associate unhealthy consumption with short-term costs predicts a
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14 lower likelihood of engaging in unhealthy behaviors, whereas there was no consistent
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16 relationship between people's perceptions of *long-term* costs and unhealthy behaviors. Coupled
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18 with our experimental data, this suggests that short-term costs are a stronger deterrent against
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20 unhealthy behaviors than long-term costs, even though consumers believe long-term costs are
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22 more prevalent and persuasive.
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28 Theoretical Contributions 29

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33 Our research extends the literature on goal pursuit and intertemporal choice, which has
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35 demonstrated the motivating power of immediate benefits (Milkman et al. 2014; Shiota et al.
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37 2021; Urminsky and Kivetz 2011; Woolley and Fishbach 2016), by showing that the motivating
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39 power of immediate *costs* is similarly powerful. In particular, we highlight the value of strongly
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41 associated costs, which is jointly driven by timing and likelihood.
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45 The present research further aligns with and broadens contemporary models of
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47 motivation. One recent model, for instance, proposed that intrinsic motivation of an activity is
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49 the perceived connectivity (or “fusion”) between a means and an end (Kruglanski et al. 2018;
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51 Woolley and Fishbach 2023), with one of the major antecedents of this connectivity being how
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53 immediately ends are achieved. For example, more immediate (vs. delayed) rewards can foster
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3 greater interest and enjoyment in a task (Woolley and Fishbach 2018). The present research is
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5 the first to generalize this prior research to include costs as well: our data suggest that the greater
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7 the temporal contiguity between an activity and its *negative* consequences, the less intrinsically
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9 enjoyable that activity will be. That is, we provide initial evidence that short-term costs that are
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11 endemic to an action can reduce anticipated enjoyment of that action.
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15 In examining anticipated enjoyment as our proposed mechanism, our research connects to
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17 the literature on the emotional antecedents and consequences of consumption (Duke and Amir
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19 2019; Labroo and Mukhopadhyay 2009; Patrick et al. 2009). We suggest that the reason a focus
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21 on short-term (vs. long-term) costs is effective is because it operates on the motivation for
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23 unhealthy consumption in the first place: anticipated enjoyment. We further suggest that the
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25 temporal component of the consequence plays a central role, such that framing a consequence of
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27 unhealthy consumption as more immediate (vs. delayed) helps reduce unhealthy behavior.
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31 Our research also relates to theoretical frameworks of self-control, such as Construal
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33 Level Theory (CLT; Trope and Liberman 2010), which finds that people adopting a high-level
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35 construal expand their regulatory scope to devalue unhealthy food by viewing it through the lens
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37 of their long-term goals (Fujita et al. 2006). While our outcomes are similar – devaluing
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39 unhealthy choices – we arrive at these outcomes through very different paths. Our approach
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41 leverages inherent immediate drawbacks, whereas a CLT approach expands regulatory scope to
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43 help consumers appreciate how unhealthy actions conflict with long-term goals. Notably, CLT
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45 primarily makes predictions for those who have the goal to be healthy, whereas our results are
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47 independent of such goals.
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51 Finally, the present work offers a special case where more strongly associated outcomes
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53 (short-term costs) are *less* salient than their less strongly associated counterparts (long-term
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costs) when considering an action. We believe this arises from the common ways unhealthy behaviors are framed, that is, as something that is enjoyable in the moment, but that carries long-term costs. We believe this black-and-white conceptualization of unhealthy behaviors causes short-term *benefits* to be more accessible than short-term costs, and long-term costs to be more accessible than short-term costs (even though long-term costs are relatively less strongly associated with unhealthy behavior than short-term costs). In other words, while short-term costs are weakly associated cognitively, they are strongly associated structurally, and therefore interventions making them salient are relatively persuasive.

Is Highlighting Short-Term Costs a Self-Control Strategy?

A remaining theoretical question raised by this research is whether undermining the appeal of unhealthy behaviors independent of the long-term goal should be considered a self-control strategy. Self-control conflicts are defined as dual-motive conflicts between a long-term goal and an immediate temptation (Fujita 2011; Vosgerau et al. 2020). For most self-control strategies, the conflict between goals and temptations is brought into relief – these strategies bolster long-term motivation (or undermine short-term temptations by construing them relative to long-term goals) so as to encourage behavior consistent with long-term goals. Indeed, holding a long-term goal (e.g., health) is often a prerequisite in self-control research, such that self-control interventions are only effective for those who hold the long-term goal (e.g., Fujita et al. 2006).

Our approach, in contrast, does not rely on the strength or conviction of long-term goals, and does not try to promote success by having long-term goals “win out” over short-term desires.

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3 We instead seek to avoid dual-motive conflicts in the first place by reducing the appeal of
4 unhealthy options (i.e., we focus on a single motive rather than the conflict between two
5 motives). Indeed, in six experiments (experiments 1b-4b), we included an explicit measure of the
6 superordinate goal (i.e., “I am currently watching my weight by eating healthier”), which did not
7 consistently moderate our results (see Web Appendix E). This underscores a strength of our
8 intervention: It is effective for individuals independent of the strength of their existing health
9 goal.
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19 Thus, whereas our strategy likely falls outside of contemporary definitions of self-
20 control, we believe this is actually an advantage. The present strategy is effective whether or not
21 people are strongly committed to their long-term goal to be healthy. As consumers vary widely
22 in their convictions to health goals, as well as the degree to which they consider the long-term
23 outcomes of their behaviors, strategies that apply broadly may be particularly useful. Overall, we
24 believe that undermining the attractiveness of temptation remains an underutilized approach to
25 curbing myopic behavior.
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38 Effectiveness of Short-term (vs. Long-term) Costs

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42 As noted in the Coda, the effect size we identify has the potential to non-trivially shape
43 health outcomes. Although we study this effect with controlled experimental designs (i.e., non-
44 field data), even if the effect is weaker in the field, it still has the potential to meaningfully
45 influence people’s health. This effect emerges consistently for a variety of unhealthy behaviors,
46 and occurs regardless of age, gender, health goals, BMI, or trait self-control, (see Web Appendix
47 E). Recent meta-analyses of health messages have found average effect sizes of $d = .17$, $r = .083$
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(Gallagher and Updegraff 2012) and $d = .13$, $r = .063$ (Shen et al. 2015) – in contrast, our effects range from $d = .19$ to $.65$ ($r = .10$ to $.31$), with a pooled estimate of $d = .35$ ($r = .17$). As we discuss in the “Implications Translated” section of the Coda, even if our effect is considerably weaker in the field, it has the potential to translate to important health benefits. That our manipulation is consistent across so many individual and situational variables, and appears relatively strong compared to other interventions, speaks to its potential when applied by consumers, marketers, and policy makers.

It is also worthwhile to consider what factors in the field may increase the likelihood of observing this effect. First, a focus on short-term costs may be most effective when: (1) short-term costs are salient at the time of choice, (2) people decide in advance (i.e., ordering online; making purchases for later consumption), and (3) used in health campaigns that typically focus on long-term consequences or fear appeals. We further expect this effect to strengthen in certain situations, such as when pairing a focus on short-term costs with an implementation intention intervention (Gollwitzer 1999), to make short-term costs accessible at the time of choice.

Second, a focus on short-term costs may be less effective when costs are weakly associated with an unhealthy behavior. The present research harnessed short-term costs that are generally recognized as associated with unhealthy consumption (e.g., blood sugar spike and crash following sugar consumption; hangover following alcohol consumption). However, some short-term costs are less ubiquitous, or only consequential for certain segments of the population. For instance, whereas teenagers or young adults may associate greasy food consumption with acne, acne is a less common consequence for older adults. We expect the effect to attenuate in situations where short-term costs are less strongly associated with unhealthy consumption. We

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3 thus suggest that to increase the effectiveness of this intervention, short-term costs be tailored
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5 such that they are strongly associated with the unhealthy behavior for the target audience.
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8 Third, whereas we find that short-term costs are more persuasive than long-term costs in
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10 general, this effect is likely to attenuate if the appeal of the unhealthy option is very strong, such
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12 as for special occasions (e.g., drinking alcohol or eating cake at a wedding). In such cases,
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14 consumers may reason that the short-term costs are a price they are willing to pay.
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17 Lastly, there may be instances in which the effect reverses such that long-term costs are
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19 more effective, such as when long-term costs are more strongly associated with unhealthy
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21 behavior. For example, vivid images emphasizing long-term costs of sugary sweetened
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23 beverages (i.e., graphically portraying diabetes, obesity, and tooth decay) reduce consumption
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25 relative to a text warning label emphasizing the same costs (Donnelly et al. 2018). Since long-
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27 term costs are more severe than short-term costs, increasing their vividness may effectively
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29 associate such severe long-term costs with the unhealthy consumption (i.e., strongly-associated-
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31 severe long-term costs may outperform strongly-associated-less-severe short-term costs).
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38 Avenues for Future Research

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42 This research takes a first step in examining how short-term costs can help people avoid
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44 unhealthy behavior. We invite future research further delineating the ways to undermine such
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46 desires, and future theoretical work examining the relationship to self-control and dual-motive
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48 conflicts. We identify four broad sets of questions that we lay out here.
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52 For one, research can examine other domains beyond food and beverage consumption.
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54 For example, short-term costs, such as the pain of payment when making a purchase, may help to
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3 curb impulse buying relative to focusing on consequences for one's long-term savings. Similarly,
4 focusing on headaches or disorientation following watching too much television may help
5 motivate people to get off Netflix. Further, prior research suggests that focusing consumers on
6 negative consequences for appearance (e.g., wrinkles, age spots) may encourage sunscreen use
7 more than focusing on health consequences (e.g., Hillhouse and Turrisi 2002). Might focusing on
8 short-term costs of forgoing sunscreen (e.g., freckles, sunburns) be even more effective?
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17 Second, whereas highlighting short-term costs can shift preferences in the moment, future
18 research can examine longitudinal interventions that emphasize short-term costs over the course
19 of many consumption choices. In other words, are interventions that train consumers to
20 spontaneously consider short-term costs effective at reducing consumption of unhealthy foods?
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26 More generally, research can examine the longevity of our cost consideration manipulation. A
27 post-test to experiment 2 provides initial insight into this question. Two weeks after conducting
28 experiment 2, we followed up with 546 of the prior participants and measured their beliefs about
29 the consequences of consuming sugary foods or drinks. We found that those who were
30 previously instructed to consider the short-term costs of sugary snacks continued to believe that
31 such foods have immediate consequences ($M = 4.41$, $SD = 1.56$) relative to those instructed to
32 consider the long-term costs of sugary snacks ($M = 3.93$, $SD = 1.67$; $t(544) = 3.51$, $p < .001$, $d =$
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.30), suggesting our cost consideration manipulation has the potential to have a lasting influence
on consumers' perceptions and, perhaps, behavior, which future research can examine.

Third, we find that timing and likelihood are two important, interrelated determinants of
the association strength between an action and its costs. However, we do not claim that timing
and likelihood are the sole determinants – rather, many factors likely jointly contribute to
association strength. For instance, in their discussion of means-ends fusion, Kruglanski and

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3 colleagues (2018) outline four determinants of association strength: timing, repeated pairings,
4 similarity of means and ends, and uniqueness of the means-end connection. Other researchers
5 have begun to mathematically quantify this association strength (Melnikoff, Carlson and
6 Stillman 2022, 2023). Given the importance of the association strength between actions and their
7 costs, future research can more comprehensively model the different determinants of associations
8 strength as well as their relative influence.
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11 Finally, future research can investigate different moderators of the documented effect.
12 For instance, one possibility is that short-term costs are most strongly associated with
13 overconsumption – that is, eating a large quantity of unhealthy food is most plausibly and
14 immediately associated with unpleasant physical costs. It is therefore possible that our effects
15 may be strongest when participants are considering larger quantities of unhealthy foods
16 compared to smaller quantities. On the other hand, consumers often underestimate serving size
17 compared to food type (healthy vs. unhealthy, Liu et al. 2019; Woolley and Liu 2021), and as
18 such, future research should investigate the robustness of our effect to serving size. Another
19 potential moderator is connection to future self (Hershfield et al. 2011; Hershfield and Bartels
20 2018; Rutchick et al. 2018). It is possible that, for those who are connected to their future selves,
21 long-term costs may be as or more effective than short-term costs, as these costs may be strongly
22 associated for those who feel connected to their future self. Future research should investigate
23 these and other boundaries of our effect.
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49 Conclusion
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3 Consumers often see the world in terms of stark black-and-white tradeoffs. Unhealthy
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5 behavior is no different: People overwhelmingly view unhealthy consumption as a tradeoff
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7 between immediate and delayed gratification. This black-and-white, good-now/bad-later
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9 conceptualization obscures the many consequences that unhealthy behaviors can carry in the
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11 short-term. By tailoring interventions that harness consumers' myopic and present-focused
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13 nature – rather than fight against it – we can build more effective interventions to promote
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15 healthier consumption.
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DATA COLLECTION INFORMATION

The first author collected the following data: experiment 2 (Prolific, Spring 2022), experiment 4b (Prolific, Summer 2020), supplemental study 1 (Prolific, Spring 2022), and supplemental study 2 (Prolific, Spring 2021). The second author collected the following data: experiment 1a (Prolific; spring 2020), experiment 1c (MTurk; Fall 2021), experiment 3 (Prolific, Spring 2022), and experiment 4a (MTurk, Spring 2022). Data collection for experiment 1b took place at Cornell University through the Business Simulation Lab in Fall 2021 by the lab manager and research assistants under the second author's supervision. Both authors jointly analyzed the data. Data, materials, syntax, Qualtrics Survey Files, and PDFs for all pre-registrations are currently stored on the Open Science Framework at <https://osf.io/nhb5w/>.

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HEADINGS LIST

1) THEORETICAL DEVELOPMENT

- 2) Effortful and Proactive Strategies
- 2) Long-Term Goal Focused Strategies
- 2) A Solution: Short-Term Cost Focused Strategies
- 2) Undermining the Appeal of Unhealthy Behavior Via Strongly Associated Costs

1) RESEARCH OVERVIEW

1) EXPERIMENT 1A: HIGHLIGHTING SHORT-TERM (VS. LONG-TERM OR NO) COSTS OF COOKIES

- 2) Method
- 2) Results and Discussion

1) EXPERIMENT 1B: HIGHLIGHTING SHORT-TERM (VS. LONG-TERM) COSTS OF ENERGY DRINKS

- 2) Method
- 2) Results and Discussion

1) EXPERIMENT 1C: SINGLE SHORT-TERM (VS. LONG-TERM) COST OF FAST FOOD

- 2) Method
- 2) Results and Discussion

1) EXPERIMENT 3: MANIPULATING IMMEDIACY HOLDING COSTS CONSTANT

- 2) Method
- 2) Results and Discussion

1) EXPERIMENTS 4A-4B: MODERATION BY ENJOYMENT (VS. CHARITY) GOAL

- 2) Experiment 4a Method
- 2) Experiment 4a Results
- 2) Experiment 4b Method
- 2) Experiment 4b Results
- 2) Discussion of Experiments 4a-4b

1) CODA: IMPLICATIONS TRANSLATED AND BELIEFS ABOUT SHORT-TERM (VS. LONG-TERM) COSTS OF UNHEALTHY CONSUMPTION

- 2) Implications Translated
- 2) Beliefs about Short-term (vs. Long-term) Costs of Unhealthy Consumption

1) GENERAL DISCUSSION

- 2) Theoretical Contributions
- 2) Is Highlighting Short-Term Costs a Self-Control Strategy?
- 2) Effectiveness of Short-term (vs. Long-term) Costs
- 2) Avenues for Future Research
- 2) Conclusion