Licensing in the Eating Domain: Implications for Effective Self-Control Maintenance

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Dissertation submitted in partial fulfillment of
the requirements for the degree of Doctor
of Philosophy in the Department of
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<u>ABSTRACT</u>

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Abstract

The current study assessed the relationship between licensing and self-control maintenance. Previous research on licensing has found mixed results for the effect of perceived progress on goal pursuit. Some studies find evidence that progress increases commitment and motivation to a goal, making licensing less likely, whereas other studies have found that progress leads to coasting and feelings of earned licensing. Previous work on managing food consumption has demonstrated that using a mental budget in tandem with a salient avoidance goal is an effective means of monitoring and limiting overindulgence. The current study used a mixed event-contingent and fixed-interval experience sampling design to examine the role of licensing in the eating domain and its effect on goal pursuit. Participants in the experimental condition were prompted with personalized commitment devices each day to assess if they promoted goal pursuit and appropriate licensing. We found that licensing occurs infrequently, but when it does occur, goal progress and goal commitment increase. The use of commitment device has little impact on licensing or goal pursuit.

Dedication

This dissertation is dedicated to my wife, Cara Wittekind. She is my unwavering support and has been throughout this entire process, from initial brainstorming to writing. I thank her also for cleaning dishes, eating takeout, and walking our dogs more often than she possibly could have wanted.

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Introduction

Think of someone with a weight loss goal. Let's call her Jodie. Earlier today, Jodie ate a large healthy salad instead of the alternative, a pepperoni pizza slice. The decision made her feel good about herself. By successfully exerting self-control, she also made progress toward her goal. Several hours have passed, and Jodie is now deciding what to eat for dinner. Keeping in mind her earlier restraint, will she maintain her healthy eating trend or reward herself for her earlier self-control, perhaps by ordering a creamy pasta dish?

If Jodie chooses the latter option, she is engaging in licensing. In simplest terms, licensing is indulgence justified by prior goal-directed behavior in the same or different domain (Khan & Dhar, 2006). Commendable behavior such as studying hard, working out, or eating healthy, for example, can all be used to rationalize subsequent gratification, such as eating dessert. Jodie is not unique in her behavior. Many popular diets are inherently based on a rationale of licensing. People who adhere to their diets five or six days a week are allowed to indulge on the weekend because they have "earned" it. In a recent qualitative study on licensing, people reported indulging for these very reasons, including "…I felt like I earned it after playing two hours of baseball," "I hadn't eaten any sort of sweet in a few days and thought I deserved something," and "I have been running on the treadmill, and wanted something sweet, so I decided to treat myself…" (Isherwood, 2013).

This sort of reasoning can be a slippery slope. Licensing sanctions unhealthy food decisions that may diminish or even cancel out progress made toward a weight-loss goal, despite the indulger's perception of deservingness. Essentially, licensing is akin to taking one step forward and two steps back, such as eating yogurt and fruit for breakfast but a cheeseburger for lunch. Progress slows, if continuing at all. The risk of repeated indulgence is particularly high given the ubiquity of obesogenic environments (Swinburn, Egger, & Raza, 1999).

However, licensing can have a positive impact on goal progress, as well. Namely, licensing may motivate people to continue pursuing their goal. Self-rewards are an effective reinforcement for current and continued self-control, and licensing acts as a reward for prior self-control and goal pursuit (Mukhopadhyay & Johar, 2009; Spates & Kanfer, 1977). The interplay of licensing, goal pursuit, and self-control, therefore, is complex, and although research has identified several predictors of licensing (see Taylor, Web, & Sheeran, 2013), gaps remain regarding the consequences of licensing on self-control maintenance and how goal pursuit is impacted over an extended period of time. The primary question yet to be answered is whether licensing is more helpful than harmful to goal pursuit in the eating domain.

This study is focused on licensing borne from perceived deservingness; that is, exploring the factors that predict when people feel that they have earned the right to license and what that means for subsequent self-control. Admittedly, deservingness

based on prior restraint is just one rationale for indulging under the full umbrella of justification-based mechanisms (Huberts, Evers, & de Ridder, 2014). Other justifications, such as availability or exceptions to the norm (Taylor et al., 2013), will be put aside temporarily in an effort to focus thoroughly on perceived deservingness.

Specifically, the current study addresses the following questions: Is licensing a constructive suspension of self-control that allows people to maintain self-control for an extended period of time? Or is licensing a lapse in self-control maintenance that effectively sabotages continued goal progress? Despite the obvious links between licensing, goal pursuit, and self-control, the nuances of how these processes interact have yet to be evaluated empirically. Furthermore, given the cumulative nature of a licensing mindset, with goal-congruent behavior influencing each successive action, evaluating the process more thoroughly over an extended time period will make it easier to understand the consequences of licensing on goal pursuit.

This document is set up as follows. First, I refine the current definition of licensing and clarify the processes excluded from the definition of licensing. Next, I discuss the roles of goal progress and goal commitment on licensing behavior in the eating domain found by the current research. Then, I consider the implications of licensing on practicing self-control as a maintenance strategy. Finally, I discuss the current study, an experience sampling study designed to explore the impact of licensing on food consumption in everyday life.

Expanding the definition of licensing

Licensing builds on the foundation that people are regularly pursuing many goals concurrently with some more salient at times than others. Implicit in this goal framework is the understanding that commitment to a goal is a multiplicative function of value and expectancy (Kruglanski, Shah, Fishbach, Friedman, & Chun, 2002). That is, not only must people highly value a goal, but they must also believe that they can (and have started to) take steps to achieve the goal. People whose subjective expectancy of goal success is low are less likely to commit to that particular goal (Kruglanski et al., 2002).

Licensing is not a spontaneous decision. People who indulge on a whim are doing simply that, indulging or engaging in instant gratification, even failing to exert self-control, but not licensing. The decision to license occurs at a hypothetical Time 2 and requires that people reflect back on earlier goal-congruent behavior before they indulge. They might ask themselves "Have I earned this? Do I deserve this?" before indulging[1] (Isherwood, 2013). Thus, licensing is an intentional but not premeditated process (Mukhopadhyay & Johar, 2009). This distinction between intentional and premeditated behavior is an important one and emphasizes a critical aspect of the licensing process: it

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[1] An additional question of interest is the frequency with which one situation of goal progress can be used to justify future indulgence (i.e. can a morning workout permit licensing at lunch and dinner?).

must occur after, rather than before, successful exertion of self-control[2]. Also implicit in the definition of licensing in the eating domain is that a person must have some type of health goal for which eating is relevant in order to engage in it. Certainly, people without such health goals also indulge (and perhaps do so more), but they should feel less of a need to justify their behavior.

An additional component of licensing to consider is the domain in which the goal-congruent behavior occurs at Time 1 and the domain of indulgence at Time 2. Initial goal-congruent behavior that justifies licensing can be in the same or different domain than the indulgence. Khan and Dhar (2006) found that participants who fulfilled an altruistic goal were subsequently more likely to purchase a hedonic item (compared to a practical item) than participants who did not have the option to fulfill an altruistic goal. Similarly, Chiou, Yang, & Wan (2011) found that people who took placebo pills framed as multivitamins reported a greater desire to engage in more hedonic activities instead of exercise, to choose a buffet meal instead of an organic meal, and to actually walk fewer steps than people who did not take any pills.

Both sets of studies suggest that the specific domain of the Time 1 behavior is less important than the exertion of self-control and perceived goal progress for licensing at

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[2] Licensing in which indulgence occurs first followed by goal-directed behavior is categorized as a compensatory behavior and is considered to be a distinct process.

Time 2. Additionally, participants in a recent qualitative study also reported cross-domain licensing: "I was craving this [treat] for a long time so it was an easy decision. Plus I felt good about the interview and I felt I deserved a nice treat" (Isherwood, 2013. Thus, people who indulge in a double cheeseburger because they studied all day are operating under the same licensing process as people who indulge because they avoided eating cookies all day.

Finally, licensing relies on the assumption that people are giving in to an avoidance health goal rather than working on initiating (or approaching) a positive health goal. Whereas approach goals provide a tangible goal to attain, avoidance goals merely indicate what should be avoided without necessarily providing structure for an alternative to approach (Roskes, Elliot, & De Dreu, 2014). For example, having a goal to avoid ice cream does not guide you to eat fruit instead. Relying solely on avoidance goals to regulate behavior provides little guidance on making progress at a later time, which suggests that licensing may be more likely and potentially harmful to the person.

Based on this goal framework, the principal points in this expanded definition of licensing are as follows:

a. For an indulgent food consumption episode to be considered licensing (Time 2), it must have been preceded and justified by successful goal pursuit or goal-congruent actions, which typically required a degree of self-control exertion (Time 1)

b. Person must have an avoidance health goal (e.g., avoid sweets) at Time 2 that has been actively suspended for the time being.

c. Not only must a person have perceived progress from initial goal-congruent actions when they occurred (Fishbach & Dhar, 2005), but this goal progress or self-control exertion, whether initiation or inhibition, must be salient at Time 2 (Mukhopadhyay & Johar, 2009).

d. Licensing occurs during a consumption episode distinct from the earlier episode of goal-congruent actions.

1. Subsequent could refer to a meal later that day, but it could also potentially include consumption across a specified unit of time, such as a vacation or a weekend. This unit of time may be a result of salience of the time frame or an individual difference.

e. Goal-congruent and subsequent goal-incongruent actions (i.e. licensing) can be in the same or different domains*

*This proposal is limited to exploring licensing behaviors in the eating consumption domain at Time 2. Goal-congruent actions at Time 1 can be in the eating domain or another domain.

What licensing is not

Several processes have been discussed in the self-regulation literature that are similar to but distinct from licensing. They include anticipatory licensing (Fishbach &

Dhar, 2005), ego depletion (Baumeister, Bratslavsky, Muraven, & Tice, 1998), balancing (Dhar & Simonson, 1999), and vicarious goal fulfillment (Wilcox, Vallen, Block, & Fitzsimons, 2009).

Anticipatory licensing refers to indulgence or goal-incongruent behavior prior to successful goal pursuit with an intention to compensate later (Fishbach & Dhar, 2005). For example, people may indulge in dessert or a big pancake breakfast because they plan to start their diets tomorrow. The process may operate on a daily basis as well, such that someone might give in to temptation in the morning with the intention to exercise later in the day. Anticipatory licensing, though interesting in its own right, poses a separate set of challenges related to goal pursuit and self-control, including the intention-behavior disconnect, and will not be discussed further.

Ego depletion appears to be a plausible underlying rationale for licensing behavior. The sequence of licensing fits with the typical ego depletion paradigm: successful self-control exertion followed by a subsequent seeming lack of self-control due to a lack of resources. However, although depletion may impact eating behavior and food consumption, it is not the primary predictor of licensing. In a pilot study, Huberts, Evers, and de Ridder (2012) found that participants who reported that they had invested effort, a behavior typically thought to deplete regulatory resources, in the beginning of the study did not subsequently demonstrate evidence of depletion on a Stroop task. According to these results, perceived investment of effort does not

necessarily result in depletion. Consequently, in the primary study Huberts and

colleagues used investment of effort as the primary manipulation and licensing behavior

as the dependent measure. They found that people who perceived having invested effort

in an initial task were more likely to indulge in a subsequent tasty unhealthy snack but

did not demonstrate evidence of depletion. These findings suggest that people do not

license because they have limited regulatory resources but rather for other reasons. I

would argue that whereas ego depletion results in self-control failure because of a lack

of resources, licensing is actually a deliberate suspension of self-control and does not

result from depleted resources. Furthermore, licensing unfolds over a longer period than

the typical time frame expected for ego depletion in its traditional definition.

Also similar to licensing is the compensatory strategy of balancing, which is used

during a single consumption episode in which the tradeoff between goals and

temptations is kept relatively even. For example, a person might eat a healthy entrée

followed by an indulgent dessert or vice versa (Dhar & Simonson, 1999). The goal of

balancing is to prevent temptation from superseding the health goal in a single

consumption episode. This emphasis on a single consumption episode is what

distinguishes balancing from licensing. Balancing might be considered an immediate

self-control decision, whereas licensing falls into the category of longer-term

maintenance of self-control.

Licensing is also separate from vicarious goal fulfillment, which is the ironic effect of choosing a goal-incongruent option because of the mere presence of a goal-congruent choice. Wilcox and colleagues (2009) explored this effect in the food consumption domain and found that providing people with a menu that contained one healthy item in addition to an array of unhealthy options activated and fulfilled people's healthy eating goals, thereby prompting (or licensing) them to choose an unhealthy option. Vicarious goal fulfillment and licensing as it is defined in this manuscript are certainly related. Both refer to conditions in which a health goal is fulfilled followed by a licensed temptation. However, vicarious goal fulfillment occurs within a single consumption episode, whereas licensing unfolds over an extended period. Moreover, and perhaps more importantly, vicarious goal fulfillment does not require a tangible exercise of self-control before indulgence.

The role of goal progress

Research suggests that goal progress influences motivation toward that goal. Whether an earlier act of goal progress promotes or reduces the likelihood of licensing, however, is unclear. According to one set of findings, people are more likely to determine that they earned an indulgence if they perceive prior goal progress (Fishbach & Dhar, 2005). Fishbach and Dhar manipulated progress of weight loss for female dieters before presenting them with the choice of an apple or chocolate as a parting gift. Participants were led to believe that they were making fast (vs. slow) progress toward

their weight loss goal. Women in the fast goal progress condition chose chocolate instead of an apple 85% of the time compared to only 58% of women in the slow progress condition. Based on these findings, people who perceive progress toward a health goal by eating a salad for lunch might be less focused on their health goal subsequently and, thus, might be more likely to license than people who do not perceive that they have made progress.

In contrast, other work in the consumer domain found that the illusion of progress induced acceleration toward a goal, and this acceleration predicted greater retention and faster reengagement in a customer 12-stamp coffee program (Kivetz, Urminsky, & Zheng, 2006). These findings suggest that an illusion of progress should lead people to accelerate toward the goal, which should promote goal-congruent behavior and, consequently, less licensing over a unit of time. Initially, the findings of Fishbach and Dhar (2005) and Kivetz et al. appear to contradict each other, but subsequent studies with additional moderators may explain the pattern more clearly. In particular, the nature of the goal (Kivetz et al., 2006) may affect whether perceived progress makes licensing more or less likely.

The specificity of the goal (i.e., concrete vs. abstract) may moderate the effect of goal progress on licensing likelihood. Progress for concrete goals may increase acceleration toward the goal because markers of success are easier to identify than markers of success for more abstract goals, such as in the health domain. Presumably,

the more apparent the success, the less likely a person will be to sabotage their progress and license maladaptively. Kivetz et al.'s (2006) studies support this reasoning. They evaluated goals that were concrete in nature (e.g., a pre-specified number of song ratings needed for a reward or coffees purchased before earning a free drink) and, thus, could be easily identified as completed. They found that people who approached goal achievement accelerated to decrease the amount of time until they achieved their goal. In other words, goal achievement became the primary focus for participants once it was a distinct reality in the near future. Presumably, licensing would not be likely for this situation because it would interfere with goal achievement.

In contrast, health goals tend to be more abstract in nature. Although weight can be monitored relatively objectively, it nevertheless fluctuates in a way that makes tracking progress difficult, particularly when people are also trying to monitor their food consumption. With fewer clear indicators of success, the opportunity to accelerate toward goal attainment is also diluted, and it may be more difficult to discern when acceleration should begin. Furthermore, a health goal is never truly completed. Even if an initial first part has been achieved, such as reaching a goal weight, the maintenance phase will likely continue indefinitely. Monitoring progress for this latter type of goal is a more difficult endeavor than counting the number of coffees that need to be purchased before earning a free one. Simply knowing that a goal must be pursued continuously without an obvious end in sight may explain why licensing occurs with perceived

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progress for some goals. Any movement toward a goal, albeit small, is needed to reinforce the person's prior actions. For an abstract health goal, then, we would expect more opportunities for licensing.

These findings imply that licensing is a function of perceived progress and the specificity of the goal. In addition to the definition of the goal being pursued, the amount of progress people believe they have made should determine the likelihood of licensing. Licensing should be most likely for people who are closest to reaching specific markers of goal progress, because these markers act as a self-reward or reinforcement for earlier goal progress. According to the findings of Huang and Zhang (2011), licensing is an effective means of self-reward. When licensing becomes miscalibrated and overused, however, is when its effects are likely to become detrimental to goal pursuit.

The role of goal commitment

Not everyone licenses in the eating domain, and people who license do not always do so. Some people are able to maintain self-control and continue successful goal pursuit without the temptation of indulgence or the need to reinforce with a sweet. The degree of commitment to a goal, distinct from progress, often predicts motivation to achieve and to stay focused on the goal. A recent set of studies (Huang, Zhang, & Broniarczyk, 2012) found that when commitment to a goal (rather than perceived progress) increased, people maintained motivation toward the goal, and subsequently

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were less likely to license. Huang and colleagues reasoned that people pursuing a highly valued goal who perceive progress toward that goal are able to utilize their progress to maintain motivation and, consequently, to increase commitment to and continue to make progress toward that goal. In this scenario, licensing should be less likely. Presumably, people who are more committed to achieve their health goal would be less likely to sabotage their progress by indulging in non-nutritive food.

Huang and colleagues' (2012) findings suggest that belief in attainability of a goal should alter perceptions of progress in such a way that maladaptive licensing becomes much less likely. According to this rationale, people with a health goal who eat a healthy breakfast should reflect on that breakfast and exaggerate the significance of that healthy breakfast in the context of goal pursuit if they are in the initial stages of goal pursuit. Alternatively, they should downplay the significance of the healthy breakfast for their health goal if they are in the advanced stages of pursuit. Regardless of the primary motivation, the outcome or desire to sabotage the progress by indulging should be less likely. Thus, people with an abstract goal who are primed to focus on commitment, instead of or in addition to progress toward their goal, may be better able to maintain self-control and license (at least in the eating domain) less frequently.

The relationship between goal commitment and goal-congruent behavior in the eating domain, specifically, has been explained through the perspective of goal conflict theory (Stroebe, Mensink, Aarts, Schut, & Kruglanski, 2008; Stroebe, Papies, & Aarts,

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2008). Goal conflict theory proposes that dieters who are exposed to diet-congruent

primes (e.g., a salad, scale, images of models) consequently strengthen commitment

toward their goal and subsequently behave in more goal-congruent ways. Buckland,

Finlayson, and Hetherington (2013) found that dieting participants who ate a salad (a

diet-congruent preload) were less tempted by and ate less of a cheesy pizza than dieting

participants who had a hedonic or neutral snack (diet-incongruent or –irrelevant

preload, respectively). The findings suggest that eating goal-congruent foods reminds

people of their existing health goals, thereby strengthening their commitment to the goal

and decreasing the likelihood of licensing.

Mental budgeting

A mental budget is an additional commitment device that may be used to

decrease licensing and enhance successful goal pursuit. Mental budgets are self-

specified sanctioned behaviors that aid self-control through enhanced goal focus and

increased monitoring (Krishnamurthy & Prokopec, 2010). They provide a tangible

reference point for people to monitor the progress of their goal. To that end, the budget

must be quantifiable in some unit, such as "I will eat only two cookies a day," and

consumption must be processed in the same unit (e.g., number of cookies eaten rather

than amount of calories from cookies). Given that goal pursuit is more successful when a

goal has tangible means and outcomes, mental budgets are an effective starting point for

regulating self-control and may be a valuable resource for reducing or managing

licensing effectively.

To be effective, mental budgets must be accompanied by an accessible

consumption-related avoidance goal and a record of consumption in the same unit as

the mental budget. Across a set of studies, Krishnamurthy and Prokopec (2010) found

that participants who had a mental budget and an active consumption avoidance goal

selected the fewest number of desserts compared to participants with a mental budget

and no primed avoidance goal. Approach goals had no effect on number of desserts

selected. Furthermore, participants whose mental budgets and dessert options were

described in the same units (fat grams or calories) selected fewer desserts than

participants whose mental budgets and dessert options were in different units (grams of

fat and calories). Thus, the combination of an active avoidance goal and a mental budget

with compatible units was essential to less unhealthy consumption.

Avoidance goals are particularly effective in conjunction with a mental budget

because they produce alertness, vigilance, and attention to detail (Koch, Holland, & van

Knippenberg, 2008; Miron-Spektor, Efrat-Treister, Rafaeli, & Schwarz-Cohen, 2011).

Given Huang and colleagues' (2012) findings about goal commitment, priming a

consumption-avoidance goal may shift people into a commitment mindset and refer

them to their specific health goals (i.e., mental budget), which should limit their

licensing. In the short term, this strategy appears to be effective at fostering self-control and limiting licensing in consumption situations.

Over an extended period of time, however, relying solely on avoidance goals to regulate behavior can negatively affect self-control. As Roskes and colleagues (2014) detail, avoidance regulation is "designed for surviving rather than thriving" (p.134). Although avoidance goals indicate what should be avoided, they rarely provide structure for what people should approach instead, which is the gap a mental budget likely fills. Mental budgets provide structure, focus, and specific markers of progress while still allowing people some flexibility to indulge (Roskes et al., 2014). Yet, this combination has not been examined over an extended period or outside of a laboratory setting, which limits its applicability to the real world where people must maintain self-control on a daily basis.

Mental budgeting not accompanied by an active avoidance goal may actually increase the likelihood of licensing because it suggests a quota that can and should be filled. For example, someone with a daily calorie allowance of 1800 who has only eaten 1250 calories by dinnertime may feel justified in indulging because of the extra calories available. This explanation is supported by Myrseth and Fishbach's (2009) two-step self-control model and the notion that initial goal progress may lead to a reduced need to self-regulate. If this person knows that she has enough calories left over to indulge, then not only will she feel less of a need to self-regulate her consumption, she may also not

identify a self-control conflict at all. These particular situations may be when licensing is an adaptive and replenishing strategy of self-control maintenance, because licensing acts as a self-reward. As long as the indulgence does not exceed the mental budget, then no damage has been inflicted on goal pursuit.

Implications of licensing on practicing self-control

The prevailing account of self-control is the limited resource model (Baumeister, Bratslavsky, Muraven, & Tice, 1998). This model conceptualizes self-control as a state-varying capacity that draws on limited psychological or physiological resources. That is, people have a limited amount of self-control that can be used during any given time period. According to this model, limited resources produce ego depletion, a phenomenon of reduced effort on a self-control task following an initial act of self-control (Baumeister et al., 1998; Vohs & Heatherton, 2000). In the context of the eating domain, limited self-control capacity, whether temporarily induced or more trait-like, reduces a person's ability to monitor their consumption consciously. For example, if a person would rather be eating a cheeseburger, then the very act of eating a salad for dinner would require self-control. Consequently, that person may be less able to resist the temptation of dessert following dinner. By this account, depletion is an involuntary response of which a person has little to no control.

Despite the popularity of the limited resource model and empirical support, it is not without flaws. Namely, the limited resource model fails to adequately explain

licensing or to consider additional influences on self-control capacity, such as motivation and deliberate suspension of self-control. Through the limited-resource framework, a deliberate suspension (i.e., licensing) would simply be perceived as a failure; this framework does not allow for additional explanations. A number of more recent studies have challenged the simplicity of the limited-resource model, noting that factors of motivation (Muraven & Slessareva, 2003; Inzlicht & Schmeichel, 2012), personal beliefs about willpower (Job, Dweck, & Walton, 2010), and goal priorities (Inzlicht, Schmeichel, & Macrae, 2014) attenuate and even eliminate ego depletion as an outcome using the typical two-task paradigm. These findings imply that self-control is not a limited resource that can be passively diminished, but rather that people have more agency regarding goal-directed behavior and related self-control than previously believed.

From these findings, a promising and plausible non-resource based model of self-control has been proposed that would also account more thoroughly for licensing. Inzlicht and colleagues (2014) suggest that behavior that was previously interpreted as self-regulatory failure may actually be a reflection of motivated switching of task priorities such that an optimal balance exists between desires (i.e., want-to goals) and shoulds (i.e., have-to goals). They posit that following an initial exertion of self-control, presumably when a person was focused on a have-to goal, attention and motivation shift toward a want-to goal. Thus, what appears to be ego depletion and lower overall motivation for goal pursuit is actually adjusted motivation that increases for temptations

and decreases for goals like healthy eating. In other words, this model supports the notion that people are licensing not because they cannot help it, but rather because their initial goal-congruent behavior signals to them a justified shift in attention and motivation from shoulds to desires.

Consider a typical example of self-control exertion and subsequent goal-directed behavior: At a baseline state before any exertion, self-control would not be compromised, and people should have the ability and motivation to resist temptation and stick to goal-congruent behavior. However, that very goal-congruent behavior may be enough to relax a person's monitoring and allow for licensing. Chiou and colleagues (2011) found that engaging in a healthy behavior (i.e., taking a multi-vitamin) increased a person's desire to engage in hedonic activities and decreased their intention to engage in exercise. Consequently, Chiou et al. argue that licensing may occur because success reduces a person's need to self-regulate. This reasoning also supports Myrseth and Fishbach's (2009) notion that self-control cannot be implemented or even deemed a failure, for that matter, if a self-control conflict is not first identified. In this situation, the licensing mindset views self-control suspension as an earned behavior. Inzlicht and colleagues' (2014) model would also support this reasoning. The earlier goal-congruent behavior allowed for a motivated attention switch from the health goal to a more desirable goal like indulging in delicious but unhealthy food.

This reduced vigilance is logical in the context of coasting, as well. Coasting refers to decreased effort for a goal when a person is close to goal attainment (Carver & Scheier, 2011); this effect is enhanced when accompanied by positive emotions (Louro, Pieters, & Zeelenberg, 2007). Licensing may be a natural consequence of coasting in some situations. If people believe that they have already made progress toward their health goal, for example, they might shift their focus to another goal. For these reasons, licensing would be considered a suspension of self-control rather than a self-control failure. However, the question remains as to whether this deliberate suspension is beneficial in the long term or is likely to be a mismanaged strategy.

People who use a form of external scaffolding may be better able to manage their self-regulatory vigilance than others who are not relying on any external support (Inzlicht et al., 2014). Potentially, a mental budget could serve as this external scaffolding by quantifying progress, thereby facilitating the identification of discrepancies between behavior and the focal goal. Hypothetically, if a person were motivated sufficiently, using a mental budget would increase adherence to a goal and reduce the likelihood of licensing disproportionately in the eating domain.

Taking into account the drawbacks of the limited resource model and the influence of attention, motivation, and goal prioritization on self-control highlighted by Inzlicht and colleagues' (2014) model, the following definition of self-control will be used to evaluate the effect of licensing: "Self-control, broadly speaking, is a conscious

decision by an individual to move in a direction that differs from that dictated by

prevailing forces in the person (e.g., impulses) or in the situation (e.g., norms, requests

from other people)" (Davisson, 2012). Those who are able to sustain self-control over an

extended period are able to resist temptations consistently and focus on the salient goal.

The current study examined whether people who are able to resist temptations and

focus on the goal can do so because they rely on licensing as a reinforcement tool for

future goal-congruent behavior or, in contrast, because they license infrequently.

The Current Research

The current study assessed the relationship between licensing and self-control maintenance in support of a weight-loss or weight-maintenance goal. Previous research on licensing has found mixed results for the effect of perceived progress on goal pursuit. Some studies find evidence that progress increases commitment and motivation to a goal, making licensing less likely, whereas other studies have found that progress leads to coasting and feelings of earned licensing. Previous work on managing food consumption has demonstrated that using a mental budget in tandem with a salient avoidance goal is an effective means of monitoring and limiting overindulgence. The current study brings these ideas together in a study of naturally occurring food consumption.

This study measured the effect of licensing in the eating domain on perceived health goal progress in an everyday context. Specifically, this study examined the question: are people able to license in an effective and controlled way such that rewards are motivating and not harmful to current and future pursuit toward a weight loss goal? To answer this question, the study used fixed interval-contingent and event-contingent experience sampling over a two-week period.

Hypotheses

In general, participants who were primed daily with a personalized avoidance goal in addition to a personalized mental budget will be less likely to license in a way

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that is detrimental to their weight loss. That is, any licensing that does occur should

have no impact on their perceived goal progress. The combination of the avoidance goal

prime and the mental budget should have made it easier for participants to keep track of

their consumption and goal progress in a more tangible and accurate manner, thereby

decreasing the likelihood of detrimental licensing. However, the means of adjustment

participants might use is unclear. If the budget and goal primes are effective,

participants in the experimental group could behave in several different ways: decrease

their frequency of licensing in the eating domain, license in a proportionate way to their

earlier goal-congruent behavior, and/or license in a domain other than food

consumption. The last option is beyond the scope of this study but is an important

consideration.

Furthermore, participants who possess the combined budget and avoidance goal

tool should be more likely to use licensing as an effective reward for earlier goal-

congruent behavior without reversing this earlier goal progress. Participants in the

control group who are not exposed to any mental budget or avoidance goal primes

should be less likely to be as acutely aware of their goal progress and licensing behavior.

The specific hypotheses are as follows:

Hypothesis 1: Daily exposure to the avoidance goal prime in addition to the

mental budget will predict less frequent licensing and/or more appropriate licensing

than daily exposure to the mental budget alone.

Hypothesis 2a: Licensing frequency will predict changes in goal progress. The more frequently people with a weight loss or a weight maintenance goal license, the more goal progress should change. The exact direction is not specified given mixed findings in the current literature.

Hypothesis 2b: Licensing frequency will predict changes in goal commitment. The more frequently people with a weight loss or maintenance goal license, the less committed they will feel to this goal.

Hypothesis 3: Trait self-control will predict frequency of licensing. People who score higher in trait self-control by initiation and self-control by inhibition should license less frequently than people who score lower on these factors.

Method

Participants

One hundred and thirteen women who were actively maintaining their current weight or attempting to lose weight were recruited through an online participant database and by posting fliers in the community. Nearly 75% of the women were recruited from the community; the remainder were undergraduates.

Participants were compensated a total of $35 ($5 for completing the initial online measures and $30 for the experience sampling phase). Those who completed 80% or more of the target signals were entered in a raffle for an additional $50. Participants were excluded from analyses for not completing more than one target signal ($n = 2$) or

for dropping out of the study prior to completion (n = 4), leaving a final sample size of 107 women (M_{age} = 27, SD = 7.8). Participants had an average starting BMI of 26 (SD = 6.4), which is considered overweight. The average final BMI was not significantly different from the starting value and will not be discussed further.

Participants were randomly assigned to a control group (n = 52), which received no mental budget or avoidance goal primes, or an experimental group (n = 55), which received daily morning prompts of their mental budgets and an avoidance goal prime.

Procedure Overview

Participants completed an online questionnaire prior to the in-person intake session that included baseline, demographic, and individual difference measures. They also created personalized prompts related to budgeting their food consumption and reasons to avoid temptations. These personalized mental budget and avoidance prompts were presented to participants in the experimental condition every morning of the study. During the in-person session, participants were trained on the study's protocol, weighed, and paid for their completion of the initial measures.

During the two-week experience sampling (ESM) phase, all participants completed daily morning and evening signals at fixed times. The morning signal asked participants about their sleep quality and primed those in the experimental group with their mental budget and temptation avoidance goal. The evening signal included a checklist of daily stressors and reassessed progress and commitment to the health goal.

These measures of progress and commitment served as two of the primary outcome variables. Participants were also asked to indicate their degree of compliance to the study for that day. The target signals were event-contingent; that is, participants completed them subsequent to any food or beverage consumption episode. They indicated what they consumed and why, as well as their emotional state prior to and after consumption.

After the two-week ESM phase was completed, participants completed several follow-up measures online to reassess goal commitment and progress. They also attended a final in-person session where they were re-weighed and paid.

Intake Session (Online and In-Person)

Recruited participants first completed several online individual difference measures and demographic items. During this session, they also specified their idiosyncratic indulgences and temptations, which was used to help them design individualized mental budgets and avoidance prompts related to their weight loss goal. Within a week of completion, participants attended a brief intake session, at which they were weighed and paid for completing the intake session. During the intake session, participants were instructed to download the Qualtrics survey link that they would use to record each consumption episode. This survey was used to record all eating and drinking episodes.

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Demographic items

Participants reported their height, gender, age, race/ethnicity, student status, and education level. Weight was recorded during the in-person part of the intake session.

Weight loss goal-related items

Participants were asked to complete items specific to their weight loss goal for the two weeks prior to completing the online questionnaire, including: (1) What is your weight loss goal? (2) What is your current strategy for weight loss? (3) Are you using a specific diet program (e.g., Weight Watchers, Nutrisystem)? (4) Are you using any online programs or apps to track your calories? (5) What is your ideal weight? (6) How would you rate your progress toward your weight goal in the last seven days? (7) How would you rate your commitment to your weight goal in the last 7 days? Items 1 and 2 were in an open-ended format. Items 3 and 4 used a *Yes/No* response format. If participants selected yes, they were prompted to indicate how often from 0 (*Never*) to 6 (*Daily*). Item 5 provided a dropdown list of weights. The response scale for Item 6 was 1 (*No/little progress made*) to 6 (*Great progress*). Finally, the response scale for Item 7 was 1 (*No/little commitment*) to 6 (*Highly committed*).

An additional item instructed participants to rank a list of consumption-related rewards (e.g. sweets, alcohol) in which they most commonly indulge from most to least often. See Appendix A for a list of these rewards.

Individual difference measures

Participants completed additional individual difference measures, including the Initiation and Inhibition subscales from the Capacity for Self-Control Scale (Hoyle & Davisson, in press) and the Cognitive Restraint subscale of the Three-Factor Eating Questionnaire-R18V2R21 (TFEQ; Cappelleri, Bushmakin, Gerber, Leidy, Sexton, Lowe, & Karlsson, 2009). See Appendix B for both measures.

Personalized prompts

During the same online session, participants completed a mental budget (adapted from Krishnamurthy & Prokopec, 2010) personalized to their weight loss goal and specific indulgences: "Suppose you were to give yourself a weekly allowance of *<indulgence inserted here>*, how many/much do you think you should consume in a week?" The temptation they had ranked highest (i.e., most tempting) in the earlier ranking item was piped in as their indulgence. An additional item served as a daily avoidance goal prime (adapted from Krishnamurthy & Prokopec, 2010) for participants: "What are some personal reasons you might have for avoiding *<indulgence here>*?" All participants completed these items, although only participants in the experimental condition were prompted with their budget and avoidance goals each morning.

Experience Sampling Phase

The ESM phase of the study consisted of two weeks of reporting food and drink consumption, daily stressors, and emotional state, as well as perceived progress toward

and commitment to their weight goal. This phase was conducted on participants'

smartphones via Qualtrics email alerts. For two weeks, participants received a daily

email alert in the morning asking them to record their sleep quality (all participants) and

prompting them with their unique mental budget and their specified reasons for

avoiding indulgences (experimental group only). The morning survey was intended as a

reminder to complete the target survey they downloaded during the intake session

following every consumption episode, regardless of type of food/beverage item or

portion size. The target survey asked participants to select explanations for why the

consumption episode occurred; the target licensing items (i.e., *I deserved it*, *I worked out*

recently, *I did well at school/work recently*, *I ate healthier recently*) were embedded in a larger

randomized list. See Appendix C for the complete list. Each night, participants received

an email alert instructing them to complete the evening survey prior to bed. In the

evening survey, they reported daily stressors, progress toward their weight loss goal,

study compliance for the day, and the number of consumption episodes they forgot to

record, if any.

First (Morning) signal

Participants received the morning survey at 6am EST and were instructed to

complete it upon waking. Participants recorded the number of hours they slept the

previous night, difficulty waking (*Very Difficult – Very Easy*), and the time at which they

woke. Next, participants in the experimental group saw a screen with the following

mental budget reminder: "During the intake session, you indicated that you would give yourself a weekly allowance of *<personalized budget here>*. Please keep this amount in mind as you go through your day." They were required to press Next before the avoidance goal prime was displayed on the next screen. The avoidance prime was presented as follows: "Sometimes, people want to avoid consuming tempting unhealthy items. Below are some of the reasons you gave earlier for wanting to avoid those items. Please keep these reasons in mind as you go through your day. *<Personalized reasons piped in at bottom of screen>*. Participants were required to press Next to continue and submit the morning signal. Unbeknownst to participants, a Qualtrics timer recorded the amount of time spent on the mental budget and avoidance goal screens.

Event-contingent signals

Participants were reminded in the morning survey to complete the target survey link (already downloaded) following each consumption episode. The survey asked participants to report what they ate or drank and why. Participants chose why they consumed from a randomized list of pre-tested options, ranging from *I was hungry* to *Others around me were eating*. As previously mentioned, the target licensing items were included within this list to reduce demand characteristics. Participants also had the option of selecting *Other* and writing in their own explanation. See Appendices C and D for the full explanations list and screenshots of the survey on a smartphone, respectively. Finally, participants reported their state affect prior to and after their consumption.

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Final (evening) signal

The evening signal was sent daily at 8pm EST. Participants were instructed to complete it prior to going to bed. Participants were asked to complete the six-item Daily Stress Questionnaire ($\alpha = 0.68$; DSQ; Rand, Hoon, Massey, & Johnson, 1990), which asked the following, "Please indicate how much stress you have felt today in the six life/health areas below (1-*No stress experienced* to 4-*Extreme stress experienced*): Physical health, Educational/vocational, Financial, Relations with friends, Relations with family, and Relations with sexual partner(s)." See Appendix E for the full DSQ.

The PM signal also had participants rate their perceptions of the following items: weight loss goal progress (1-*No/little progress* to 6-*Great progress*), weight loss goal commitment (1-*No/little commitment* to 6-*Highly committed*), study compliance (1-*No compliance* to 6-*Complete compliance*), adherence to their mental budget (experimental group only; 1-*No compliance* to 6-*Complete compliance*), and also asked them to record any missed consumption episodes.

Follow-up session

After the two-week ESM phase ended, participants completed a brief online follow-up measure, during which they were asked about their overall progress during the study (1- *No/little progress* to 6-*Great progress*): "During the 2-week tracking, how would you rate your progress toward your weight goal?" They were also asked (1-*No/little commitment* to 6- *Great commitment*): "During the 2-week tracking, how

committed did you feel to your weight goal?" Finally, participants were prompted with their own mental budget and were asked to assess their overall adherence to their mental budget (1-*Not at all/Very little* to 6-*Very well*): "How well did you feel like you stuck to that amount during the study?" Upon completion of this session, participants scheduled a final in-person session, where they were re-weighed and paid for their participation.

Results

This section will first detail the data management and descriptive aspects of analyses, including the way missingness was handled and how the predictors were aggregated. Next, the general models estimated will be described before addressing each specific hypothesis. The data pertaining to each hypothesis also include several exploratory analyses.

Event-Contingent Signals (Food Records)

When recording consumption episodes, participants were encouraged to enter entire meals and snacks together in one entry rather than in separate entries for each item. Five independent raters coded the healthiness of each food entry on scales of 1 (*very unhealthy*) to 5 (*very healthy*). They were instructed to record a 0 for either category if the entry did not provide enough information. The ratings of each coder were averaged to create an overall health variable (*M*= 3.08, *SD*= 1.04) with high inter-rater

reliability (α = 0.82). Healthiness of food entries did not differ significantly by condition, p > .31.

Defining Predictors and Composites

Licensing frequency, goal progress, and goal commitment are the Level 1 predictor variables. Licensing frequency was calculated by summing the total number of licensing explanations selected subsequent to a consumption episode. It was then aggregated at the day level to create a frequency index for each participant. This index of licensing frequency was then person-centered (i.e., the difference in licensing frequency from a person's usual amount) and between-person centered (i.e., the difference from the average person's licensing frequency) using Curran and Bauer's (2011) technique. Perceived goal progress and perceived goal commitment were separately calculated by creating a mean level of current progress and current commitment for each person, respectively, that was then person-centered and between-person centered. The goal referred to was the weight loss or weight maintenance goals that participants had recorded in the pre-intake online session.

Condition (exposure to personalized mental budget and avoidance goal), trait self-control by initiation and inhibition, and level of cognitive restraint were treated as Level 2 variables. Day was included as a time covariate and was grand mean-centered at the midpoint of the study. All other Level 2 variables were also grand mean-centered. As shown in Table 1, reliability for the Capacity for Self-Control Scale is more than

adequate, as is the reliability for the Cognitive Restraint subscale of the Three-Factor

Eating Questionnaire given that only three items comprise it.

Table 1: Standardized Reliability of Level 2 Measures

Level 2 Measure	Cronbach's α
TFEQ-CR	0.63
SC-Initiation	0.83
SC-Inhibition	0.85

Six emotion composites were created by dividing the emotions into positive,

negative or other (for the Other and None of the Above options) and further

categorizing them into emotions felt before or after consumption (e.g., BeforePositive,

AfterPositive).

Compliance

Because participants were not required to complete a specific number of signals

per day, exact compliance for target signals cannot be calculated. The average number of

completed consumption-related signals per participant was 64, which corresponds to

about four signals each day per participant.

The completion rate for the daily AM and PM signals was 95% and 88.5%,

respectively. Participants' average self-reported compliance across the two weeks was

on the higher end of the 0-to-6 scale ($M = 5.02$, $SD = 1.20$). However, participants in the

experimental condition reported significantly greater compliance ($M = 5.13$, $SD = 1.16$)

across the two weeks than participants in the control condition ($M = 4.89$, $SD = 1.25$), F (1, 4201) = 39.36, $p < .0001$.

Missingness

A visual inspection of the data revealed that approximately 75% of participants completed both the AM and PM survey each day. Of those who were missing at least one daily survey, 20% completed only the AM survey and 4% completed only the PM survey. Despite the fact that the PM survey had the highest missingness rate, 20% missing is a typical rate in data sets with missing values (Schlomer, Bauman, & Card, 2010). The PM missingness was potentially a result of forgetfulness rather than intentional non-compliance. Several participants commented during the study that they sometimes forgot to check their phones for the survey before bed. Less than 1% missed both AM and PM surveys in the same day.

The data were systematically assessed for non-random patterns of missingness by creating auxiliary variables for the primary predictors (i.e., mean goal commitment, mean goal progress, and licensing frequency) and correlating them with a variable of interest with no missingness (i.e., condition). This practice is in line with recommended missing data strategies (Graham, 2003; Newsom, 2015). Neither missingness in goal progress nor goal commitment was significantly correlated with condition, $p > .10$, which indicates that goal progress and goal commitment can be considered to be missing at random (MAR). Licensing frequency was significantly negatively correlated

with condition, r (5350) = -0.07, $p < .0001$. The finding suggests that licensing missingness is not at random (MNAR), which is not surprising given the nature of the research design.

However, the weakness of the correlation also suggests that this auxiliary variable need not be included in the model to ensure that the data can be estimated properly (Newsom, 2015). Moreover, licensing can be considered to be a legitimate form of missingness (Osborne, 2013) in that the absence of data supports the research questions; that is, licensing would not be expected for every time point. Despite licensing frequency's MNAR status, maximum likelihood estimation can account for the missingness in this data without biasing standard errors or estimates greatly (Graham, 2003) and better than listwise deletion can. Regardless, the missingness should be acknowledged when interpreting the pattern of results.

Manipulation Check

The amount of time participants spent on the mental budget (M = 5.52s, SD = 8.2) and avoidance goal (M = 4.73s, SD = 6.75) primes in the AM survey was recorded as a manipulation check for those in the experimental group. These times decreased significantly across the two weeks for the mental budget prompt, F (15, 2739) = 14.21, $p <$ .0001, and avoidance goal prompt, F (15, 2739) = 20.19, $p < .0001$ (e.g. mental budget: M_{day1} = 14.1s vs. M_{day14} = 3.44s). Licensing frequency did not significantly change as a function of day, β = 0.01, z = 0.80, p = .42, which suggests that the decrease in viewing

time did not weaken the manipulation across the course of the study. Instead, the mental budget and avoidance goal may have been internalized, thereby requiring less viewing time.

Model Fit

Initial diagnostic assessments of the goal progress and goal commitment variables indicated that both were normally distributed with skewness (*progress* = .36, *commitment* = .23) and kurtosis (*progress* = -0.14, *commitment* = .03) close to zero. Unconditional models (i.e., no predictors and a random intercept only) were estimated using restricted maximum likelihood (REML), producing intra-class correlations (ICCs) of .36 for both. These ICCs indicates that 36% of the variance in daily goal progress and daily goal commitment is due to within-person differences, and multi-level models are justified (Peugh, 2010).

Models were built using an iterative process and maximum likelihood estimation. Non-significant terms were omitted from each subsequent model. A generalized linear mixed model with a random intercept was used to account for nested observations within individuals for all normally distributed dependent variables. A log link was used to model variability in overall goal progress and goal commitment, respectively, as a function of: budget and goal prime exposure (condition), licensing frequency (person- and between-person centered), health value of recorded foods, pre-BMI, self-control by inhibition, self-control by initiation, and restrained eater status.

Person-centered licensing frequency was also modeled as a random slope, and day was included as a covariate.

Because licensing frequency is a count variable and the data follow a Poisson distribution, the model for licensing frequency as an outcome differed from those for goal progress and goal commitment. Maximum likelihood estimation with a log link was used to model the effect of trait self-control by inhibition and by initiation on the frequency of licensing.

Participants in the experimental condition did not differ significantly from those in the control condition for BMI, trait self-control, restrained eater status, impulsivity, or age, all ps > .10, indicating that random assignment to condition was effective.

Effect of mental budget and avoidance goal exposure

The first hypothesis predicted that participants in the experimental condition would license less frequently or more appropriately than participants not exposed to their budget or avoidance goals. Time (measured by day) was included as a covariate. This hypothesis was partially supported.

Experimental condition does not significantly predict daily goal progress, β = 0.13, t (108) = 0.75, p = .46, but time does significantly predict goal progress, β = -0.03, t (4133) = -4.55, p < .0001. With each passing day, perceived progress decreases by .03. This time effect, however, is qualified by a significant interaction of condition and time on goal progress, β = -0.03, t (4131) = -2.81, p < .01. A simple slopes analyses revealed that

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participants began the study with similar perceptions of goal progress, but those in the

experimental condition experienced a downward trend of perceived goal progress

across the two weeks, β = -.06, p = .11 , whereas those in the control condition maintained

the same level of perceived goal progress, β = -.03, p = .16. Simple slopes are displayed in

Figure 1.
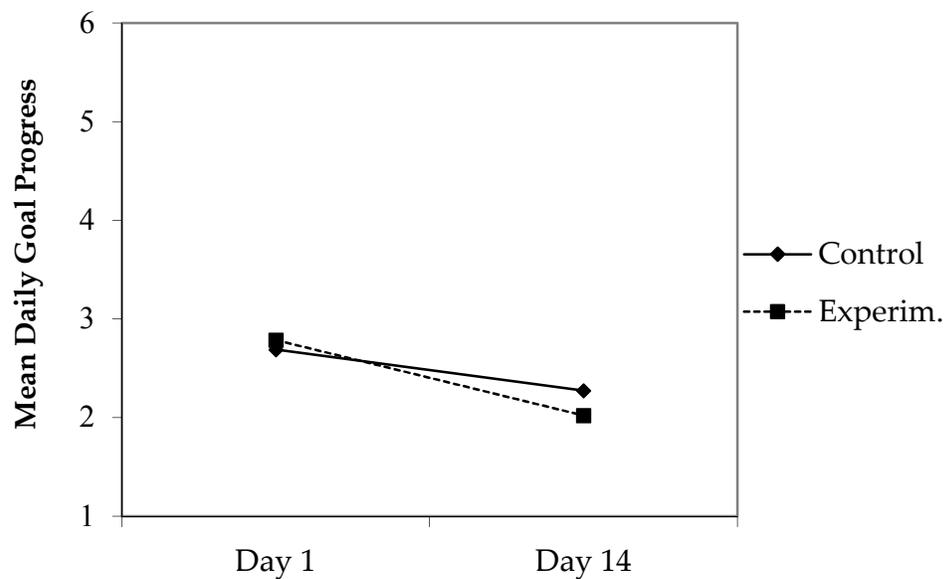
Figure 1: Interaction between Condition and Day on Goal Progress

Time significantly predicts goal commitment, β = -0.015, t (4128) = -2.08, p < .05,

such that with each passing day, perceived commitment decreases at a linear rate.

Participants with daily exposure to the mental budget and avoidance goal primes show

a trend of greater daily goal commitment (M = 3.35) than those in the control condition

with no exposure (M = 3.05), β = 0.28, t (107) = 1.62, p = .11. The interaction between time

and condition on goal commitment failed to reach significance, t (4123) = -1.06, p= .29. In

other words, the relationship between condition and goal commitment does not vary as a function of day of the study.

Effect of mental budget and avoidance goal exposure: Summary of findings

The effect of condition on progress and commitment both failed to reach significance, which was unexpected. Time did significantly predict goal commitment and goal progress, such that commitment and progress both decreased with each additional day during the study. The goal progress findings were qualified by a significant interaction between condition and day on daily goal progress. Participants prompted daily with their mental budget and avoidance goals experienced a decrease in goal progress across the course of the study, whereas participants not prompted maintained their level of goal progress. This same interaction did not reach significance for goal commitment.

Perceived progress toward weight goal

Part A of the second hypothesis posited that licensing would significantly change perceptions of goal progress. This hypothesis was fully supported. Licensing significantly predicts goal progress at both between- person centered and person-centered levels, $\beta = 0.17$, t (3480) = 3.49, $p < .001$ and $\beta = 0.16$, t (3435) = 4.34, $p < .0001$, respectively. At the between person level, controlling for person-centered licensing frequency, each additional licensing occasion corresponds with a slight increase ($\beta = 0.17$) in average goal progress. Moreover, a person's licensing frequency significantly

predicts an increase in her own average goal progress. Controlling for between-person centered licensing frequency, with every additional licensing occasion for a person whose licensing frequency is above the overall average, a corresponding increase (β = 0.16) in her goal progress is expected.

These finding suggest that people only license when they believe they are making progress. Person-centered licensing frequency is also significant as a random component, which indicates that the relationship between daily licensing frequency and perceived goal progress differs by individual participant. The interactions between condition and licensing frequency at the person- and between-person levels on goal progress failed to reach significance, $ps > .6$. That is, exposure to mental budget and the avoidance goal prime did not alter the relationship between licensing frequency and perceived goal progress.

However, considering that participants' goal progress decreased across the course of the study, the pattern is peculiar. To explore further if the feedback between licensing and goal progress is cyclical, I tested two interactions between-person centered licensing and self-control by inhibition and initiation, respectively. People who license because they perceive progress toward their goal may then experience a decrease in goal progress once the licensing occurs, especially if the licensing occasion is disproportionate to the progress (e.g., treating oneself to five cookies instead of one).

Those who license proportionately to their goal progress should not experience a decrease in goal progress.

In fact, a marginally significant interaction exists between self-control by initiation and person-centered licensing frequency on goal progress, $\beta = 0.08$, t (3464) = 1.82, $p = .07$. Simple slopes analysis revealed that participants who are high in self-control by initiation who also licensed one standard deviation above the mean perceived their goal progress to be significantly higher than other high-initiation people who licensed less than average, $\beta = 0.11$, $p < .001$. In contrast, participants low in self-control by initiation perceive their goal progress to be the same regardless of licensing frequency, $p = .76$. Results of this analysis are displayed in Figure 2.
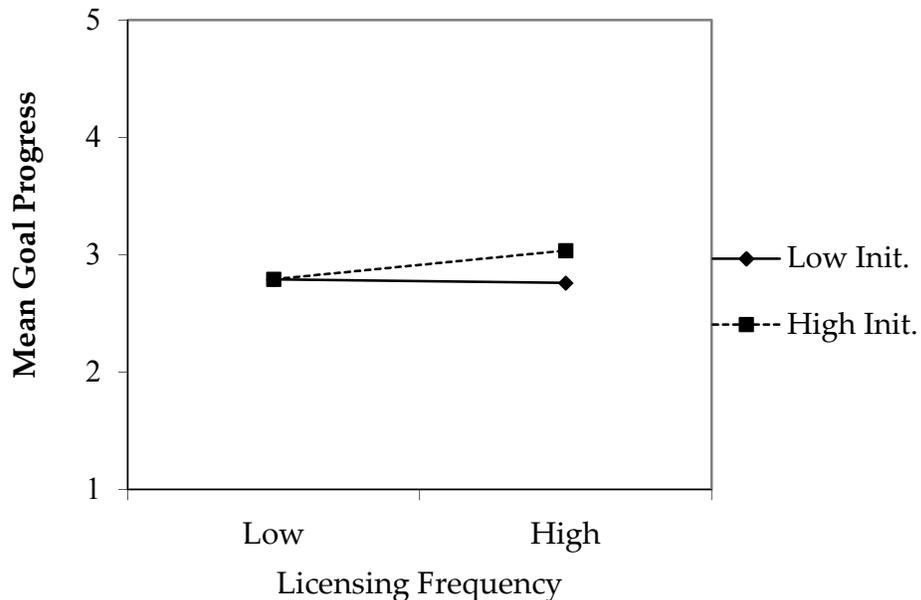

Figure 2: Interaction between Self-Control by Initiation and Person-Centered Licensing Frequency on Goal Progress

This pattern suggests that people who are higher in self-control may license more frequently than the typical person may; that is, not only might they be able to license more proportionately, but they do so while maintaining their high goal progress. In other words, this group of people may be using licensing legitimately as a reward rather than as a justification for indulgence. The interaction between self-control by inhibition and person-centered licensing frequency on goal progress failed to reach significance, p = .22.

Health of the food does not significantly predict perceived goal progress, t (3446) = 0.42, p = .68, nor does health value interact significantly with licensing frequency at any level, ps > .23.

A person's trait-level self-control by inhibition is also a significant predictor of goal progress, β = 0.32, t (103) = 2.03, p = .045. That is, as participants' capacity to inhibit increases, so does their perceived goal progress albeit only by .32.

Exploratory analyses

No specific hypotheses were made for BMI or reported emotions during consumption episodes. However, their role in the model is important to examine. For the interested reader, these post hoc analyses are included in Appendix F.

Perceived progress toward weight goal: Summary of findings

Hypothesis 2a, licensing would significantly change goal progress, was fully supported at the between- and within-person levels. At the between-person level,

increased licensing frequency was positively associated with overall goal progress. At

the within-person level, a person's own licensing frequency corresponded with an

increase in her goal progress. This latter relationship was significant as a random effect,

which suggests that the relationship between daily licensing frequency and perceived

goal progress is different for each person.

Self-control by initiation moderated the relationship between-person centered

licensing and goal progress, such that those higher in the capacity to initiate who also

licensed frequently were able to maintain their high levels of goal progress. In contrast,

people lower in the capacity to initiate perceived their goal progress at the same level

regardless of licensing frequency. Self-control by inhibition was a non-significant

moderator. However, there was a significant main effect of self-control by inhibition on

goal progress. The higher participants were in their capacity to inhibit, the higher their

reports of perceived goal progress. Health value of the food does not predict goal

progress.

Perceived commitment toward weight goal

Hypothesis 2b, licensing would significantly change perceived goal commitment,

was partially supported by the data. Between-person and person-centered licensing

frequency are both significant predictors of goal commitment across all participants, $\beta =$

0.15, t (3476) = 3.09, $p < .01$ and $\beta = 0.17$, t (3429) = 4.38, $p < .0001$, respectively. However,

the direction of the relationship was unexpected. Controlling for person-centered

licensing frequency, each additional licensing occasion corresponds with a small increase in average perceived goal commitment. Controlling for between-person centered licensing frequency, participants who licensed more often than the group mean also had greater perceived goal commitment, albeit small. This pattern is the same as the pattern for goal progress, which is perhaps less surprising given that perceived goal progress and perceived goal commitment are strongly positively correlated, r (4213) = 0.82. Findings from previous research would have predicted a negative relationship between licensing and goal commitment.

These main effects are qualified by a significant cross-level interaction between condition and person-centered licensing frequency on perceived goal commitment, β = 0.14, t (3489) = 2.87, $p < .01$. As displayed in Figure 3, a simple slopes analysis revealed that for participants in the experimental condition, each additional licensing occasion above their group's average was significantly positively associated with their perceived goal commitment, β = 0.14, $p < .0001$. No such pattern exists for participants in the control group, β = -0.001, $p = 0.99$.

Between-person centered and person-centered licensing frequency were both significant random effects, which suggests that not only does the influence of licensing frequency on goal commitment vary by person, it also varies within person.

Health value of the reported foods does not significantly predict goal commitment, t (3421) = 0.07, p = .94, nor does health value interact with any level of licensing, ps > .62.

Self-control by inhibition marginally predicts goal commitment, such that a one unit increase in capacity to inhibit corresponds with a 0.29 increase in daily goal commitment, β = 0.29, t (101) = 1.67, p = .10.

Exploratory analyses

As with the goal progress model, BMI and the emotion composites were assessed for their effect on goal commitment. Please refer to Appendix F for the full set of analyses.
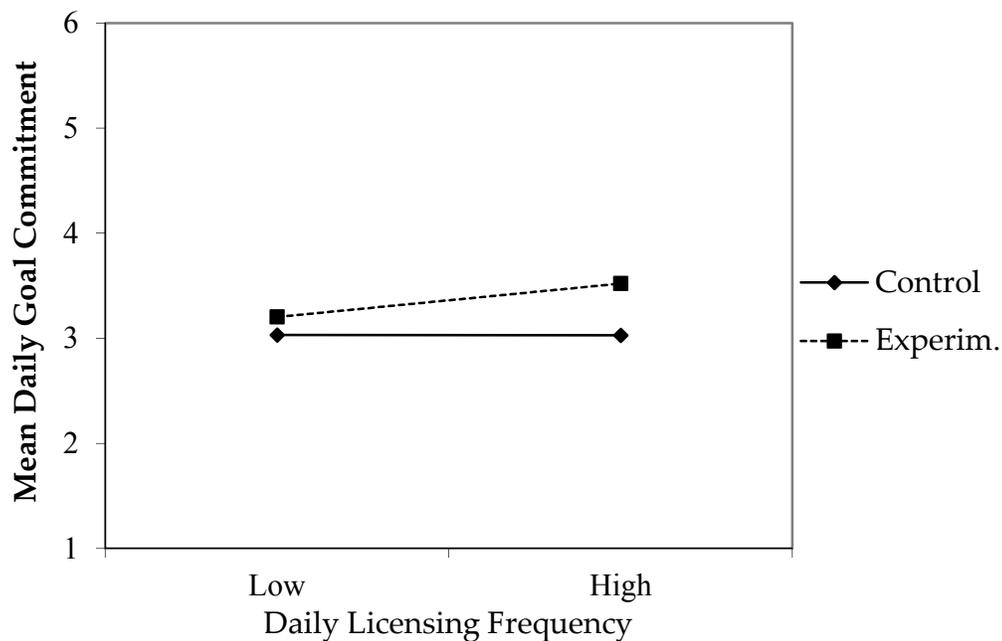

Figure 3: Interaction between Condition and Licensing Frequency on Goal Commitment

Perceived commitment toward weight goal: Summary of findings

Hypothesis 2b predicted that increased licensing would be negatively associated with goal commitment. This prediction was not supported. Licensing frequency significantly predicted goal commitment but in the opposite direction than expected. The pattern of findings matched that of goal progress, such that increased licensing frequency at the between- and within-person levels corresponded with a slight increase in goal commitment. This pattern was particularly pronounced for participants in the experimental condition, as evidenced by the significant interaction displayed in Figure 3. Licensing frequency at the between- and within-person levels were significant random effects, suggesting that the relationship between licensing frequency and goal commitment differs by person, as with goal progress. Health value had no effect on goal commitment.

Unsurprisingly, an increase in the capacity to inhibit corresponds with an increase in daily goal commitment. That is, people who are better able to inhibit impulses feel more strongly committed to their weight goal.

Licensing frequency as an outcome

The final a priori prediction was that both forms of self-control capacity would significantly predict licensing frequency. This third hypothesis was not supported. Neither self-control by initiation nor self-control by inhibition significantly predicts licensing frequency, $\beta = 0.24$, $z = 1.13$, $p = .26$ and $\beta = -0.34$, $z = -1.16$, $p = .24$, respectively.

However, licensing on any given day was infrequent. The average participant licensed less than once per day (0.73). This number did not differ significantly by condition, β = 0.17, z = 0.61, p = .54.

Exploratory analyses

Reported number of missed consumption episodes per day is positively correlated with daily licensing, r (3449) = 0.11, p < .0001. As daily licensing occasions increased, so did the number of reported missed consumption episodes.

Between-person and person-centered goal progress both failed to predict licensing frequency significantly, ps > .55, as did between-person and person-centered goal commitment, ps > .93. BMI was not a significant predictor, either, β = 0.02, z = 1.09, p = .28. Please refer to Appendix F for additional analyses assessing the role of emotion on licensing frequency.

Licensing frequency as an outcome: Summary of findings

Hypothesis 3 predicted that self-control by inhibition and initiation would predict licensing frequency. Presumably, people who possess higher self-control are better able to control their licensing occasions. Yet, neither inhibition nor initiation predicted licensing frequency. Licensing occurred at an infrequent rate, which may account for this finding. Licensing occasions did not differ by condition as might have been expected, nor did goal progress or goal commitment predict licensing frequency. BMI was not a significant predictor, either.

Exploratory analyses

Given the low rate of licensing frequency in this linear model, person- and

between-person- centered licensing frequency were both assessed for curvilinearity.

Quadratic terms were created for the within- and between-person levels of licensing.

Controlling for the respective linear terms, goal progress was then regressed onto each

of these variables separately. The quadratic between-person centered licensing predictor

was significant for goal progress, β = -0.05, t (3491) = -3.20, $p < .01$, and marginally

significant for goal commitment, β = -0.03, t (3494) = -1.71, $p = .09$. Despite the significant

predictors, a visual inspection of the regression lines is not compelling enough to change

the interpretation of the findings; thus, these are not discussed further. Please refer to

Appendix G for the figures.

Discussion

The present study is the first to investigate the relationship between licensing, self-control, and goal pursuit in the eating domain in a natural setting. Because findings from prior research examining the behavioral outcomes of goal progress and goal commitment have been mixed, this study sought to determine the primary manner in which licensing is used in the course of ongoing goal pursuit. Licensing can be "one step forward and two steps back" for goal progress, but when used effectively, licensing can reinforce goal progress and commitment to propel a person on a forward trajectory without setbacks.

Mental budget and avoidance goal exposure

Contrary to expectation, condition alone did not influence perceived goal progress. That is, for participants exposed daily to their personalized mental budgets and avoidance goal primes perceptions of goal progress did not change. Several possible explanations exist for this pattern. First, participants spent significantly less time reading their mental budgets and goal primes as the study continued, which may have reduced their effectiveness. Alternatively, the mental budgets and goal primes, which had been created in some cases weeks prior to the ESM phase, may not have been accurate or relevant during the study. Possibly, participants' mostly highly desired temptations vary by day. Moreover, because participants were unaware of the true purpose of creating the mental budget and avoidance prime, they may have created hypothetical

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budgets rather than realistic ones to which they would truly adhere. A final possibility is that the budgets and avoidance primes were accurate and relevant, but the participants simply did not follow through on their intentions. This last scenario is certainly within the realm of possibility given the myriad research on how poor people are at self-regulating in ways they say they will (Baumeister & Heatherton, 1996).

However, condition and time did interact to produce changes in perceived progress. Specifically, participants in both conditions began the study with equal perceptions of goal progress, which decreased over the course of the study. The pattern was particularly pronounced for participants in the experimental condition, who were reminded of their mental budgets and avoidance goals. This finding suggests that the daily mental budget and goal priming were effective, but their effect may have been additive such that they influences progress only after a certain threshold (i.e., number of days). Once this threshold was reached, participants were particularly sensitive to their goal progress, thus making it easier to believe that they fell short of their goals. Future research is needed to unpack this complex effect of goal and budget reminders.

Perceived progress toward weight goal

Licensing influenced goal progress both within and between participants. Licensing frequency significantly predicted greater goal progress, such that participants only licensed when they felt that they had made progress on their health goal. This finding is consistent with findings from work on goal progress and indulgence

(Fishbach & Dhar, 2005) and coasting (Carver & Scheier, 2011; Louro, Pieters, & Zeelenberg, 2007), both of which indicate that people reward themselves close to goal attainment, presumably when it has been earned.

An alternative interpretation of these findings is supported by Kivetz et al.'s (2006) work on goal pursuit. Specifically, Kivetz and colleagues found that perceived progress toward concrete goals increased acceleration toward achievement, presumably decreasing the likelihood of setbacks (e.g., licensing). A corollary of their findings suggests that an abstract goal would be slower to achieve because recognizing progress is more difficult. Because health goals tend to be abstract in nature and require diligent maintenance, they are hardly ever truly completed. Thus, participants may have felt compelled to reward themselves after any progress they recognized during the course of the study.

However, despite the fact that licensing is positively related to perceived progress, participants' goal progress decreased across the course of the study. It is possible that the relationship between licensing and goal progress is cyclical and interactive. That is, people may only license when they believe that progress has been made (i.e., that they have earned it), but once they do license, they feel like they have reversed, or at least slowed, their goal progress. Future research should explore whether daily goal progress mediates the relationship between a person's licensing frequency and their overall goal progress on a weekly basis. Future studies might also manipulate

the nature of health goals assigned to participants to determine the effects of intentionally concrete or abstract goals on goal pursuit.

Participants high in the capacity for self-control by initiation were the exception to this rule. For these participants, frequent licensing was associated with high levels of goal progress, which suggests that those with a high capacity to exert self-control are able to utilize licensing effectively as a goal motivator. For others, licensing may be self-sabotage. Explaining this relationship definitively is difficult because it fluctuates by person. Future studies might make use of latent class analysis to determine if specific types of licensers exist and which strategies might be most effective and motivating for successful goal pursuit for different types of licensers.

Because licensing typically involves indulgence of unhealthy foods more often than healthy ones, it is reasonable to assume that health value would have an effect on goal progress. However, the results do not support these assumptions. Healthiness of the food had no effect on perceived goal progress, nor did it interact with any levels of licensing. Several possible explanations exist. First, licensing may be a state of mind that has less to do with the actual health value of a food. Perhaps once people decide to license, what they eat does not matter. Second, health value may have been too imprecise of a variable. People were encouraged to record whole meals and snacks together, often resulting in two, three, or sometimes four items included in one entry. Because health raters were instructed to evaluate the entries holistically rather than

breaking them down by individual food within an entry, the health values assigned to

an entry may have been unable to capture fully the health variability in one entry. In

other words, an unhealthy food that a participant would have labeled as a licensing

occasion may have been offset by a healthier food also included in that entry. This

potential balancing (Dhar & Simonson, 1999) was not evaluated but would be a fruitful

pursuit for future ESM studies.

Perceived commitment toward weight goal

Licensing frequency was not associated with decreased goal commitment.

Participants in the control condition displayed no relationship between licensing

frequency and goal commitment, whereas participants in the experimental condition

experienced greater perceived goal commitment with each additional licensing occasion.

The direction of this latter relationship was the opposite of expectation.

These findings were nearly identical to those for goal progress with one

exception: condition had no effect on the relationship between licensing and goal

progress. This pattern suggests that using a combination of a mental budget and an

avoidance goal prime as a commitment device may be more effective for maintaining

goal commitment than for sustaining goal progress. Typically, the goal pursuit literature

distinguishes goal progress and goal commitment. For example, Fishbach and Dhar's

(2005) findings predict a positive relationship between licensing and goal progress,

whereas Huang et al. (2012)'s work suggests that goal commitment should be associated

with less licensing. The current study found that goal commitment and goal progress were highly positively correlated. This lack of differentiation may be attributed to the colloquial uses of progress and commitment in comparison to how the research literature defines these constructs. Future research should ensure that the two constructs are clearly distinguishable from each other as presented to participants, especially in an ESM design.

Not surprisingly, people who scored higher on self-control by inhibition tended to perceive greater goal commitment than those who scored lower. This finding parallels that of a recent ecological momentary analysis study. Hofmann, Adriaanse, Vohs, and Baumeister (2014) found that dieters who were higher in response inhibition were more likely to resist food desires, not consume desired and often unhealthy food, and lose weight over a four-month period than people who were lower in response inhibition. Hofmann et al.'s findings taken with the current study's findings suggest that people with a higher capacity to inhibit may be better at assessing their goal commitment and goal progress realistically, and thus, know when to treat themselves and how to do so proportionately.

As with goal progress, the health value of the food did not influence goal commitment or interact with licensing to impact goal commitment. The reasons are likely the same as for goal progress, especially when considering the strong correlation between progress and commitment.

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Licensing as an outcome

On average, people reported licensing in the eating domain less than once a day, regardless of condition. No previous work has established a baseline licensing rate, which makes it difficult to know whether the low rate found in this study is typical or unusual. This finding may very well reflect the true incidence of licensing in the eating domain, and if so, it may suggest that people are using licensing as an appropriate reward strategy. If licensing were being used to justify every indulgence within or outside the eating domain, reported daily licensing occasions would likely be higher.

However, this interpretation is complicated by the fact that licensing did not significantly predict goal commitment or goal progress. Thus, the causal direction of the proposed conceptual model may be inaccurate. Rather than perceived goal commitment and goal progress leading people to license, licensing occasions may be leading people to infer that they have made goal progress and goal commitment. This pattern can be explained by Myrseth and Fishbach's (2009) two-step self-control model. That is, participants who licensed may not have perceived a self-control conflict, which resulted in positive assessments of their goal pursuit and no apparent self-control failure. Alternatively, some may consider one licensing occasion per day to be more consistent with self-sabotage, but whether that is true depends on the type and amount of licensing. These latter factors were not within the scope of this study and should be considered in future licensing work.

Other potential explanations for the licensing rate are methodological in nature. This study limited its scope to licensing borne of perceived deservingness and, thus, did not consider other justification-based rationales within or outside the eating domain, such as availability or viewing a temptation as an exception to the norm (Huberts et al., 2014). Participants may have been licensing at a higher rate, either in combination with or instead of licensing in the eating domain. The current study was limited to measuring a specific type of licensing behavior—perceived deservingness—within the eating domain for sake of parsimony and researcher interest, but the conclusions made from this study may have been arguably more complete had licensing behavior in other domains been included.

A final alternative explanation is that the pattern of missingness for licensing frequency may have skewed the pattern of results. The average reported licensing rate may be artificially lower than it truly was during the study because participants may not have reported certain consumption episodes when they licensed if they felt guilty. In fact, this explanation is consistent with exploratory analyses that found a significant positive correlation between reported missed consumption episodes and daily licensing frequency, such that higher licensing totals is associated with increased missing consumption episodes. The causal root for this complication cannot be addressed using data from the current study, but it indicates a strong need for future research to assess

licensing in a more controlled manner, and perhaps, a study designed with planned missingness patterns.

Neither self-control by inhibition nor self-control by initiation predicted licensing frequency, which suggests that the cause of licensing is more complex than a simple deficit in self-control capacity. Furthermore, neither goal progress nor goal commitment predicts licensing, which implies that licensing leads to changes in goal progress or goal commitment but the reverse is not true. Typically, this question of causality in an EMA study can be addressed through lagged effects, but the current data do not allow for this because licensing was so infrequent. Furthermore, the actual time frame of licensing is unknown. Licensing effects may occur within a day or across a week; therefore, determining causality in a natural setting would be difficult.

Limitations

Like any study, the present work has several limitations that should be addressed in future research. First, data were collected in November-February essentially capturing the entire holiday season, including the post-New Year's resolution period. Because this is typically a challenging time for people maintaining or losing weight, it may have been unique and non-representative of the rest of the year. This uniqueness is not necessarily negative, but it may have contributed to a reduced count of licensing if people were waiting until Thanksgiving or Christmas Eve, for example, to license. Relatedly, as is often the case with experience sampling studies, participants

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may have intentionally under-reported indulgences for fear of judgment, despite repeated assurances that their data were anonymous, which would have resulted in a suppressed count of licensing.

People were also unable to access their earlier food entries once they submitted them. Presumably, they could remember what they ate, but the food monitoring may have been more effective if they had access to all records. If they did have access, licensing may have increased because people were better able to assess when to reward themselves. Two additional minor factors to address in the future are time of weigh-ins and inclusion of exercise or other possible licensing domains. First, participants did not complete their initial and final weigh-ins on the same day of the week or at the same time, although all attempts were made to do so, which limited the role of weight as an outcome factor. Second, assessing exercise was outside the scope of this study, but including it may have provided better context for understanding the relationship between goal pursuit, licensing, and self-control. Future work should seek to include this factor.

Conclusions

One of the primary contributions of this work was to assess licensing in the eating domain and evaluate its role in self-control maintenance outside the lab. The present study is the first of its kind to assess self-control, licensing, and goal pursuit in the eating domain in an experience sampling design. Licensing was defined as a

deliberate suspension of self-control with the *potential* to be misused rather than as a failure of self-control. The results suggest that licensing occurs less frequently in the real world than might have been previously expected. When one does license, both perceived goal commitment and perceived goal progress significantly increase, but the reverse relationships were not true. This finding bears emphasis. Perceived goal commitment and goal progress do not necessarily lead people to license. Rather, people seem to be justifying their licensing by perceiving increased commitment and progress to their weight goal as if to reassure themselves that their reward was truly earned.

The current study cannot answer whether the licensing → commitment or licensing → progress patterns are causal. Future studies should attempt to document causality and, further, whether licensing is being used appropriately. In other words, do people perceive increases in goal commitment or goal progress for all or only certain licensing occasions? Assuming the rate found in the current study is an accurate reflection of licensing in a natural setting, we can deduce that people are not overusing licensing in the way it has been defined in this study. This, coupled with the findings of increased licensing for people high in trait self-control, suggests that licensing is being used appropriately, but a definitive answer cannot be stated.

Using a mental budget as a commitment device seemed to be helpful for maintaining high levels of goal commitment but was less effective for sustaining goal progress. Furthermore, the combination of a mental budget and avoidance goal prime

had no effect on licensing frequency. Unlike previous lab studies, which found that mental budgets and salient avoidance goals were necessary to limit indulgence (Krishnamurthy & Prokopec, 2010), the present study suggests that this pattern does not play out in the real world in the same way. That is, people who were reminded of their goals regularly did not change their licensing frequency. Regardless, regular and consistent monitoring of food intake with mobile apps, such as Fitbit or MyFitness Pal, may be an effective way to support pursuit of a weight loss or weight maintenance goal (Wharton, Johnston, Cunningham, & Sterner, 2014).

A practical concern, then, is the need for weight loss plans to incorporate this relationship between goal commitment, goal progress, and licensing, including the differential influence of a mental budget on progress and commitment. Certainly, many weight loss plans do allow for rewards—an online search of "cheat days" and dieting produces nearly seven million hits—but these licensing days do not seem predicated on definitive adherence during the week. Progress toward and commitment to one's weight loss goal are assumed, but how often are they regularly assessed? Furthermore, a weight loss plan that allows for licensing at the end of every week may be unrealistic or unsustainable for many women. Not only that, the set-up is likely to foster the "one step forward two steps back" type of licensing.

Given the licensing rate at less than once a day and its positive association with goal progress and goal commitment in this study, for which the average BMI was in the

overweight range, a weight loss plan that incorporates rewards more frequently may be more motivating and, ultimately, more effective. Research suggests that Weight Watchers is more effective than other commercial weight loss plans and weight loss without a specific plan (Heshka et al., 2003; Tsai & Wadden, 2005). The findings from this study are consistent with that. Weight Watchers uses Points (i.e., clear progress markers and tangible mental budgets), regular weigh-ins (e.g., assessments of progress), and allows for rewards if people are under their Points limit, which is motivating and reinforces continued commitment to the goal.

The role of licensing within the context of goal pursuit and self-control maintenance is complex, especially in a natural setting with ubiquitous food temptations. The findings from this study are consistent with the notion that licensing is not simply a temporary loss of self-control, but rather is used in the eating domain judiciously, and is positively associated with goal commitment and goal progress. Thus, the literature should make room for licensing to be viewed as a tool to be used sparingly to boost goal pursuit rather than viewed solely as a loosely held standard of deservingness with maladaptive consequences for goal pursuit.

Appendix A: List of rewards and temptations

- Sweets (e.g., cookies, cake, muffins, ice cream, milkshake, candy, chocolate, etc.)

- Sugar sweetened beverages (e.g., blended coffee drinks, sodas, etc.)

- Salty (e.g., chips)

- Savory (e.g., wings, chicken fingers, burgers, etc.)

- Alcohol (e.g., wine, beer, liquor)

- Larger portion sizes of a food or beverage

- Extra helpings of a food or beverage

- Other (write in)

Appendix B: Individual difference measures

Capacity for Self-Control Scale (Hoyle & Davisson, in press): Initiation and Inhibition subscales

Instructions: Below is a list of statements about behavioral tendencies. Please read each statement carefully and indicate how often your behavior reflects the tendency. (5-point scale ranging from *hardly ever* to *nearly always*.)

*Odd-numbered items reflect inhibition; even-numbered items reflect initiation.

1. I am able to resist temptations.

2. I have no trouble getting started on difficult or time-consuming projects.

3. I have trouble resisting my cravings.

4. I waste a lot of time before getting down to work.

5. It is hard for me to resist acting on my feelings, even when they lead me astray.

6. I go right to work on challenging new obligations.

7. I stop myself from doing things I know I shouldn't do.

8. I delay as long as possible before starting something I expect to be unpleasant.

9. Problematic impulses get the best of me.

10. I waste time on things that don't really matter, rather than working on things that do.

11. I can deny myself something I want but don't need.

12. I choose leisure over making progress on things I need to do.

13. My bad habits cause problems for me.

14. I just can't seem to get going, even when I have much to do.

15. I am unable to control the urge to do something I know I shouldn't.

**Cognitive Restraint Sub-Scale of the Three-Factor Eating Questionnaire-R18V2
(Cappelleri, Bushmakin, Gerber, Leidy, Sexton, Lowe, & Karlsson, 2009)**
Unless otherwise noted: (1 -*Definitely true* to 4 -*Definitely false*)

1.   I deliberately take small helping to control my weight.

2.   I don't eat some foods because they make me fat.

3.   I consciously hold back on how much I eat at meals to keep from gaining weight.

4.   I'm always so hungry that it's hard for me to stop eating before finishing all the food on my plate.

5.   I'm always hungry enough to eat at any time.

6.   When I see something that looks very delicious, I often get so hungry that I have to eat right away.

7.   I often get so hungry that my stomach feels like a bottomless pit.

8.   Being with someone who is eating often makes me want to also eat.

9.   Sometimes when I start eating, I just can't seem to stop.

10.   Do you go on eating binges even though you're not hungry?

        a. Response scale: (1) *Never*; (2) *Rarely*; (3) *Sometimes*; (4) *At least once a week*

11.   How often do you feel hungry?

        a. Response scale: (1) *Only at mealtimes*; (2) *Sometimes between meals*; (3) *Often between meals*; (4) *Almost always*

Appendix C: Explanations for consumption

- I just felt like it/I just wanted it
- I worked out recently*
- I was hungry
- I was thirsty
- To save money
- I did well at work/at school recently*
- I deserved/earned it*
- It's a habit
- This is what I always eat
- Others were consuming it
- To relieve stress
- I was out of groceries
- I ate healthier recently*
- It was right there in front of me
- I was sad/frustrated/happy/anxious/etc.
- I know it's good for me
- It tastes good
- I ate a heavy meal recently
- It will give me energy
- To keep me full longer than another food or drink item
- To help me lose weight
- It makes me feel good mentally
- It makes me feel good physically
- I didn't want to feel sluggish
- To avoid judgment from those around me
- Other (type in)

*Indicates licensing explanation

Appendix D: Target Signal Screenshots
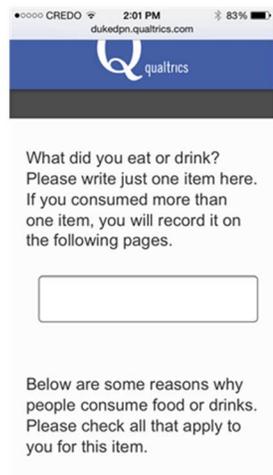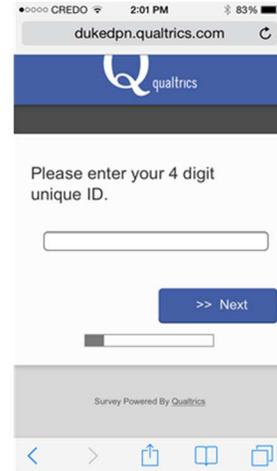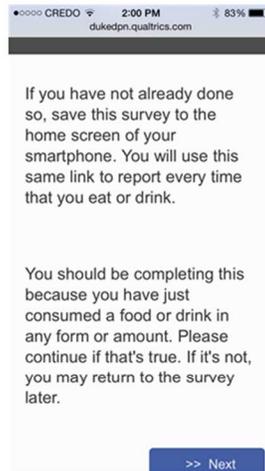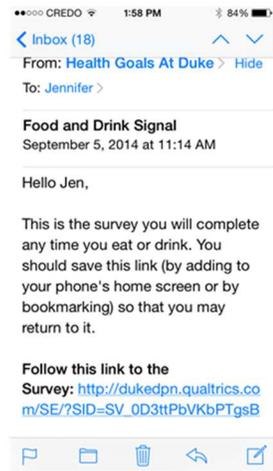
Appendix E: PM Signal Stress Reports

Daily Stress Questionnaire (Rand, Hoon, Massey, & Johnson, 1990)
Using the scale below, please indicate below how much stress you have felt today in the six life/health areas: 1 (*No stress experienced*) to 4 (*Extreme stress experienced*):

Physical health

Educational/Vocational

Relations with friends

Relations with family

Financial

Relations with sexual partner(s)

Appendix F: Post Hoc Analyses

Goal Progress

A significant interaction exists between BMI and between-person centered licensing frequency on goal progress, $\beta = 0.01$, t (3448) = 2.45, $p < .05$. A simple slopes analysis revealed that high BMI (+1 SD) participants who licensed more frequently (+1 SD) perceived their goal progress to be significantly higher than other high BMI participants who licensed less frequently (-1 SD), $\beta = 0.57$, $p < .001$. The same significant pattern is true for low BMI (-1 SD) participants, $\beta = 0.40$, $p < .001$. These patterns are displayed in Figure 4. In other words, licensing less frequently does not necessarily indicate greater perceived goal progress, regardless of BMI. This finding, however, does not make clear whether people who are licensing often do so because they first perceive goal progress or because they are justifying their consumption by assuming they have made progress.

Reported negative emotion before consumption and reported positive emotion after consumption significantly predict goal progress, $\beta = -0.06$, t (3910) = -2.06, $p < .05$ and $\beta = 0.08$, t (3781) = 2.13, $p < .05$, respectively. That is, reported negative emotions prior to consuming was negatively associated with perceived goal progress, whereas positive emotions after consuming was positively associated with perceived goal progress. These emotions were reported retrospectively, which limits the ability to make causal connections.
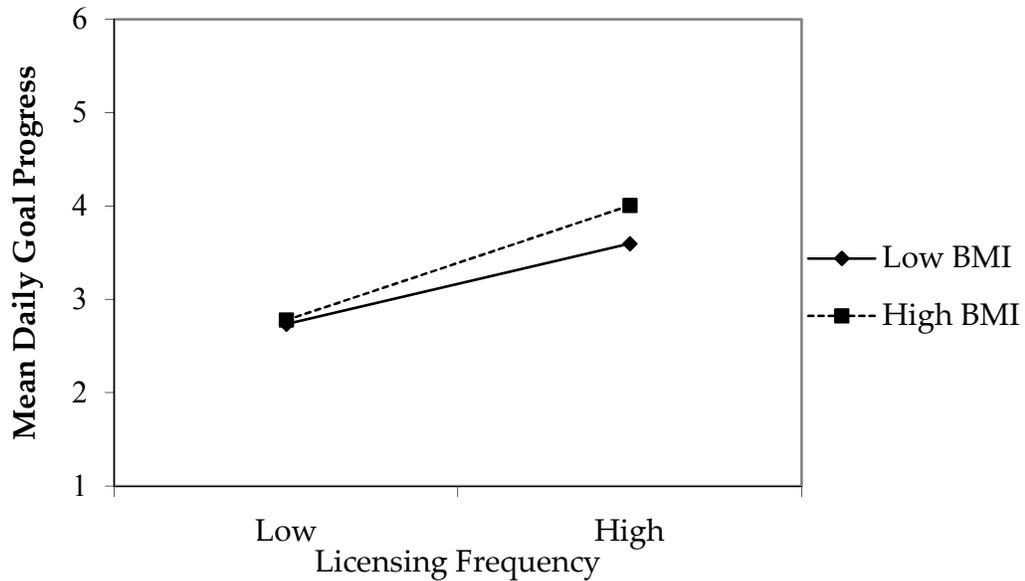
Figure 4: Interaction of BMI and Licensing Frequency on Goal Progress

Goal Commitment

BMI does not significantly predict goal commitment, $\beta = 0.02$, t (111) = 1.39, p = .17, nor does it interact significantly with between person- or person-centered licensing frequency, ps > .20.

Feeling negatively prior to consumption significantly predicts a decrease in goal commitment, $\beta = -0.07$, t (3269) = -2.20, $p < .05$. In contrast, feeling positive after consumption significantly predicts an increase in goal commitment, $\beta = 0.11$, t (3245) = 2.59, $p < .01$.

Licensing Frequency

Reported positive emotions after consumption significantly predict licensing frequency, $\beta = 0.31$, $z = 2.44$, $p < .05$. The average participant who reported positive emotions after a consumption episode had a daily licensing count of 0.66; that is, less than one occasion per day. However, participants whose post-consumption positive

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emotions were one standard deviation above the mean had a daily licensing count of 1.1,

nearly twice the number of licensing occasions compared to the average participant who

reported positive emotions after consumption.
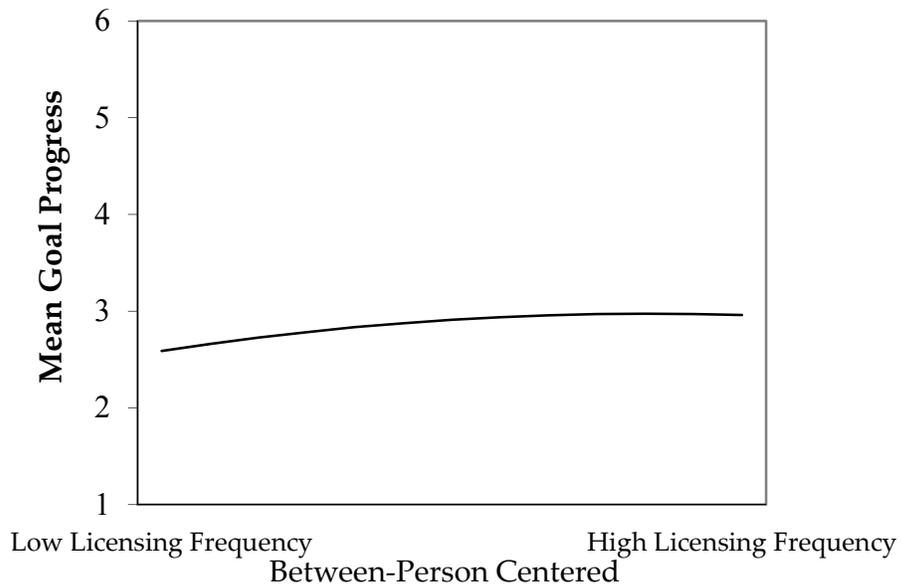
Appendix G: Exploratory Analyses Figures

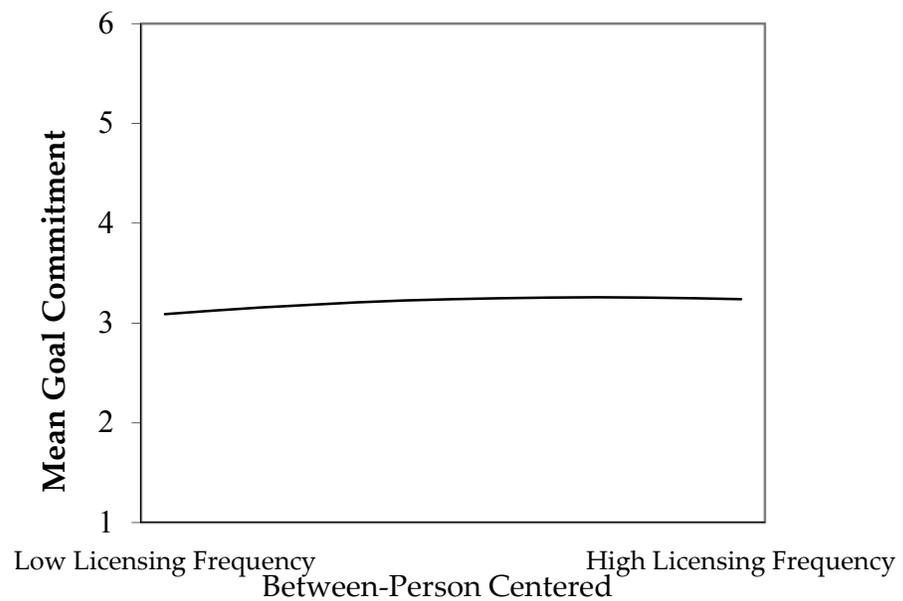**Figure 5: Quadratic Effect of Between-Person Centered Licensing Frequency on Mean Goal Progress**

Figure 6: Quadratic Effect of Between-Person Centered Licensing Frequency on Mean Goal Commitment

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Biography

Jennifer Camille Isherwood was born in Red Bank, NJ, on May 12, 1988. She attended Lafayette College in Easton, PA, and received a Bachelor of Arts in Psychology in May 2010. While at Duke pursuing her PhD, Jennifer earned her Master's degree in Psychology in April 2013. Jennifer was also awarded the Sulzberger-Levitan Social Policy Graduate Research Fellowship for the 2014-2015 academic year.

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