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A descriptive multi-attribute utility model for everyday decisions

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Abstract We propose a descriptive version of the classical multi-attribute utility model; to that end, we add a new parameter, momentary salience, to the customary formulation. The addition of this parameter allows the theory to accommodate changes in the decision maker's mood and circumstances, as the saliencies of anticipated consequences are driven by concerns of the moment. By allowing for the number of consequences given attention at the moment of decision to vary, the new model mutes the criticism that SEU models call for an omniscient decision maker. Use of the model is illustrated with a large-scale longitudinal study showing that adolescent smokers have higher utility for smoking than nonsmokers. We also propose to use the model hierarchically to describe everyday decisions that people deal with repeatedly. Big decisions, which set policy, guide a host of nested little decisions, which in turn lead

Ward Edwards died in 2005. Although this manuscript was written several years after his passing, he participated in the development of several of the key ideas, especially the notion of option packaging. The new parameter, momentary salience, was introduced to resolve the disconnect between laboratory studies of decision making, in which the options and their consequences are fully laid out before the subject, and everyday decisions, in which the decision maker usually has to determine what the reasonable options are before choosing among them. For further discussion of our collaborative efforts, see the introductions in Weiss and Weiss (2009).

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to action. For a little decision, one of the options will be consistent with the policy, and will inherit its high utility. Accordingly, most little decisions will be made quickly and will follow the policy. However, people do sometimes decide to violate their own policies, and we describe how these lapses can lead to collapse of the policy.

Keywords Adolescent smoking · Big decision · Hierarchical model · Little decision · Momentary salience · Multi-attribute utility

The subjective expected utility model (Edwards 1954) has long been appreciated for providing a theoretically grounded basis for making economic decisions. The applicability of the model was greatly expanded when decision analysts realized that non-economic decisions could be conceptualized similarly. Important non-economic decisions usually involve multiple consequences (Keeney and Raiffa 1976; Shepard 1964). The generalized version is known as the multi-attribute utility (MAU) model. The key assumption that allows summing across multi-faceted outcomes is that the consequences are commensurable. Values can be expressed in economic units, whatever their underlying dimensions, and that makes the arithmetic straightforward. When giving prescriptive advice, a decision analyst will elicit values and weights, apply the formula, and let the client know which option is implied by those personal parameters (von Winterfeldt and Edwards 1986). In the present paper, we propose to extend the MAU model further, applying it descriptively to the decisions that people make every day.

A challenge to our goal is that utility models have not been viewed as credible descriptions of how people actually make decisions when there is no analyst standing by. The criticisms have come from distinguished sources. Simon (1982) speaks of "bounded rationality," viewing subjective expected utility as unrealistically presuming an idealized decision maker who knows all possible outcomes and calculates perfectly. This theoretical shortcoming may underlie empirical demonstrations that the model is incorrect, perhaps because people realize they are not omniscient and accordingly attempt to employ simpler strategies. Kahneman and Tversky (1984) have illustrated how judgmental heuristics, or short-cuts, lead to descriptive failures of the classical model. Expected utility models (Edwards 1954) have not been good descriptors of people making economic decisions (Edwards 1961; Luce 1992). Perhaps the most extreme push in this direction has come from Gigerenzer (Gigerenzer et al. 1999), who finds that choices are often governed by values on a single dimension.

To counter the theoretical objections, we propose a modification to the standard formulation of the MAU model that deflects them. We provide some empirical evidence showing that the new model does have descriptive capability. We then introduce a hierarchical version of the model that describes how people establish policies that simplify future decisions. We conclude by presenting a research agenda showing some types of studies that might be inspired by the model.

1 The descriptive MAU model

As with traditional MAU, we characterize a decision option in terms of its consequences. The decision maker identifies the option with the highest MAU and chooses

the behavior associated with that option. The modification we propose to make the MAU model descriptive calls for the incorporation of a new parameter we call momentary salience. The new parameter captures the idea that the attractiveness of an option may depend on what is happening *right now*. We want to explain why an apparently sensible teenager might ingest an unknown drug at a party or why a thrifty gourmet might order an expensive dessert on his birthday, but not on another restaurant occasion.

We propose that three aspects of a consequence determine how it contributes to the utility of the decision option. This decomposition gives rise to three model parameters attached to each consequence. Whenever a moment of decision arises, consequences are evaluated using the three parameters in accord with the expression:

$$\text{MAU} = \sum_j \text{SV}_j \cdot \text{SP}_j \cdot \text{MS}_j$$

where j indexes the consequences anticipated by the decision maker if she chooses that option.

(1) Subjective value (SV) is the perceived worth of the consequence, a quantity with either a positive or a negative sign. The consequences for everyday decisions will often be non-monetary, so we think of this dimension as having units that might as well be given an arbitrary name such as utiles (Mosteller and Nogee 1951). In adopting this labeling convention we are making the same assumption decision analysts make, namely, disparate types of consequences are commensurable and can be traded off against one another.

(2) Subjective probability (SP) is the perceived likelihood that the consequence will occur given that the option is chosen. SP is dimensionless and ranges between 0 and 1.

(3) Momentary salience (MS) is the importance of that consequence to the person at the moment of decision. Importance is a word with multiple connotations, which is why we prefer the new term. Here we mean how much the consequence matters in the current evaluation. MS is also dimensionless and ranges between 0 and 1, where zero means the decision maker is ignoring the consequence completely and 1 means it is getting full attention. By not constraining the sum of the saliencies, we accommodate the intuition that some decision options evoke a greater number of important consequences than do others.

von Winterfeldt and Edwards (1986) preferred to describe the extent to which a consequence is appreciated as its desirability, a combination of value and importance. In their formulation, consequences have only two parameters attached to them. In prescriptive applications, where the task of the decision analyst is to help the decision maker assign sufficient weight to the important consequences, regarding utility as the product of desirability and likelihood is appealing because that formulation mimics the classical mathematical definition of expected value. In a descriptive application, however, it seems advantageous for the model to be able to capture the case in which a consequence might be desirable (or undesirable) if the decision maker were to think about it, but the consequence escapes consideration at the moment. Because

saliencies vary over time, the model can accommodate intertemporal inconsistencies in choices (Loewenstein et al. 2003). Momentary salience has a conceptual similarity to the shifts in attention postulated in decision field theory (Busemeyer and Townsend 1993), except that we regard the saliencies as static rather than varying during the evaluation of an option.

The product of the three parameters for a consequence determines that consequence's contribution to the total utility. The option with the highest utility, as expressed by the sum of the products across consequences, is chosen. For a dieter considering meal options, for example, consequences of a particular choice might include physical (gain weight), psychological (feel satisfied), and social (receive praise) outcomes. The model accommodates decisions that appear to be emotion-based, in that affective consequences (Mellers and McGraw 2001) enter into the model in the same way that other consequences do.

The model is personalized via the parameters attached to each consequence. The parameters capture how people regard the behavioral options, such as the meal choices under consideration. Their current values depend upon the individual's history, knowledge, and physiological status, as well as on mood and circumstance. Because the parameters combine multiplicatively, a consequence the decision maker is not attending to (zero momentary salience) or thinks will not occur (zero subjective probability) contributes zero to the MAU for the option. Thus, the number of consequences that play a role in the decision is incorporated into the model via the new momentary salience parameter. We think that number is small, generally no greater than 12 for a decision made without a mechanical aid (Edwards and Barron 1994), both because processing capacity is limited and because a decision maker usually focuses narrowly on a small number of consequences, perhaps as few as one or two.

2 Empirical evidence for the descriptive MAU model

The descriptive MAU model was first applied in a longitudinal, school-based investigation of the onset of cigarette smoking among a sample of 1,363 culturally diverse seventh graders (Weiss et al. 2009). The goal was to examine the connection between utility and smoking behavior, and ideally to predict which of the nonsmoking kids would take up usage on the basis of their utilities prior to initiation.

Our studies begin by asking members of a focus group drawn from the population of interest to write down the consequences attached to the decision option of interest, which usually involves a change of some kind. For example, in this case we asked a sample of young adolescents what they thought might happen if they were to take up smoking. To avoid potential biases, we exclude members of the focus group from the subsequent main study.

The ideal consequences list for a study encompasses all of the outcomes considered as a decision is reached. Because the momentary salience attached to the consequences is presumed to fluctuate over sampling occasions, the ideal list would include any consequence likely to be relevant. In addition, the consequences in the list need to be independent, lest the analyst overweights the estimated impact of a consequence that enters the formal MAU computation multiple times although the decision maker

counts it only once in the thought process. The independence we have in mind here refers to the outcomes being distinctive as to content, rather than being statistically uncorrelated.

To construct a list used for eliciting parameters, we combine the responses from the focus group, then prune the list (subjectively) for independence. We also eliminate unreasonable (also determined subjectively) consequences listed by only one or two respondents. For the main study, carried out with a large sample, we follow Edwards (1973) "divide and conquer" strategy by eliciting the three disaggregated model parameters for each consequence from each respondent, then integrate according to the MAU equation.

In the study of tobacco initiation (Weiss et al. 2009), there were 10 consequences in the final list. Elicitation consisted of asking respondents for ratings of value, likelihood, and momentary salience[1] for each of the 10 consequences, thereby yielding a total of 30 parameter estimates per person. MAU for smoking was computed separately for each subject by multiplying the three parameters for each consequence, then summing over the 10 consequences. The hypothesis is that the sum is predictive of the choice made by the individual; that is, MAU should be higher for those who choose to smoke than for those who choose not to smoke.

In this study, elicitation took place in classrooms. Because the option to smoke is not available now, the saliencies are not really momentary. Accordingly, we might interpret saliencies reported here as reflecting importances in a more overall sense. In effect, we are examining the prior decision to become a smoker rather than the immediate decision of whether to smoke a cigarette now. If elicitation had taken place in a setting where smoking was possible, short-term considerations might have come into play.[2]

Two rounds of elicitation were carried out, one in the 7th grade year and another in the 8th grade year. All of the MAUs we calculated from the reported parameters were negative, reflecting the didactic success of the classroom instruction California students receive regarding tobacco. However, the mean 7th grade utility for smoking among the minority who had already initiated smoking[3] ($n = 152$, 11.2%) when the study began was significantly higher (=less negative) than for those who had not. Similarly, the mean 8th grade utility for those who had not reported smoking

[1] The rating scale for values had seven options (recorded as −3 to +3), while that for likelihoods and momentary saliencies had six options (recorded as 0–5, then transformed to range between 0 and 1). Verbal labels were attached to the response options rather than numerals, as suggested by the work of Reagan et al. (1989). Additional information regarding procedure is given in Weiss et al. (2009).

[2] Examining a child's decision to smoke a cigarette now is not ethically feasible or legally permitted. While the consequences for the decision to initiate smoking and the consequences for the decision to smoke a cigarette now are likely (but not guaranteed) to be similar, the momentary saliencies are surely different. Initiation usually occurs in a social setting with peer influence having paramount salience.

[3] In the smoking literature, several gradations of smoking status are used. "Lifetime smoker" refers to a person who has had at least one cigarette, while "past 30-day smoker" refers to one who reports smoking within the last month. For adults, "past-30-day smoker" accurately characterizes current smokers. However, for adolescents, regular patterns are typically not established during the earliest years of smoking. Those who experiment with tobacco are far more likely to become regular smokers than those who do not. Therefore, we define adolescents as smokers if they meet the "lifetime smoker" criterion, capturing the idea that those kids are most at risk from a health perspective.

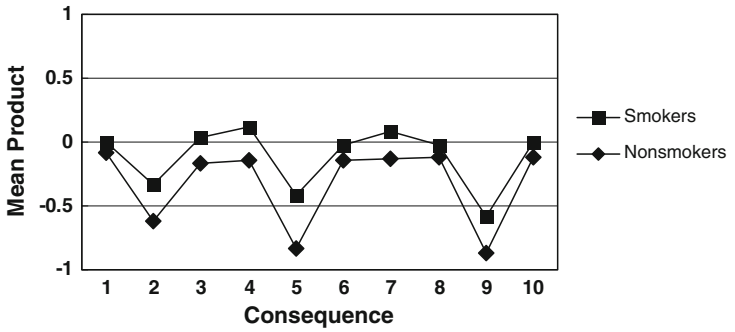

Fig. 1 Mean product of the three parameters (SV, SP, MS) for each of 10 consequences for 7-th grade smokers and nonsmokers. The result of summing the products for an individual yields that person's MAU. The possible range for each product is −3 to +3. Consequences: *1* become more popular, *2* smell bad, *3* enjoy the taste, *4* become less stressed, *5* damage lungs, *6* keep weight down, *7* deal with sad feelings, *8* feel more like an adult, *9* trouble with parents, *10* help concentrate better

during 7th grade but then initiated during the next year ($n = 165$, 11.4% of the 805 7th grade nonsmokers) was significantly higher than for those who remained nonsmokers (logistic regression: OR = 1.574, 95% CI = 1.162–2.130, $p = 0.003$). These two results suggest that the model was able to capture the utilities that underlie smoking among current users. In addition, the momentary salience construct gained credence by exhibiting the largest inter-individual variability of the three parameters.

The attempt to use previous-year utility to predict who would initiate during 8th grade was not quite as successful. A logistic regression did not achieve significance (logistic regression: OR = 1.000, 95% CI = 0.998–1.002, $p = 0.881$). Encouragingly for the model, though, the mean 7th grade utility among the future smokers was higher than for those who remained nonsmokers. Thus, there is a hint of predictive capability, but it is challenging to predict a child's behavior a year in advance. Power is limited because not many of the children took up smoking.

Means of the products of the three parameters for each of the 10 consequences are shown in Fig. 1, separated according to smoking status. When summed, the 10 products for an individual yield that child's MAU for smoking.

Means of the subjective values are shown in Fig. 2. Differences in values underlie the differences in products, and therefore in utilities as well.[4] The similar pattern for smokers and nonsmokers suggests that the various consequences are appreciated in

[4] The slight anomaly between Figs. 1 and 2, that the smokers' mean product for a few consequences is slightly positive although all mean subjective values are negative, is the result of missing data. If a respondent reported a subjective value for a consequence but missed either the corresponding subjective probability or momentary salience, that person's product for the consequence could not be calculated. Between 40 and 60 respondents per consequence, roughly 5% of the sample, haphazardly omitted a necessary parameter report. This level of carelessness is typical of adolescents responding to a paper and pencil questionnaire. We could have omitted the subjective values from such respondents from the estimate of the Mean, which would have made the data appear more coherent, but because there were relatively few smokers we elected to preserve the sample size by including them.

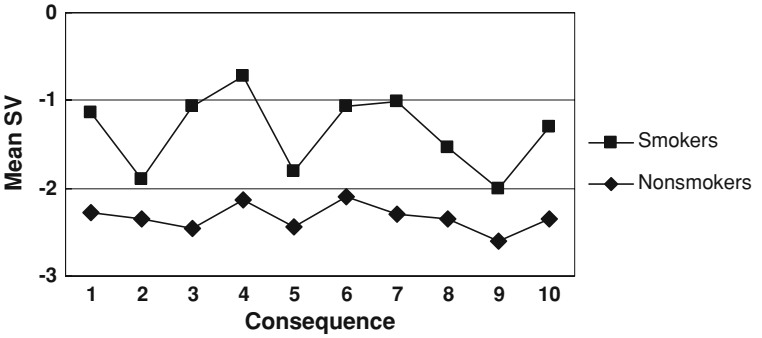

Fig. 2 Mean subjective value for each of 10 consequences for 7-th grade smokers and nonsmokers

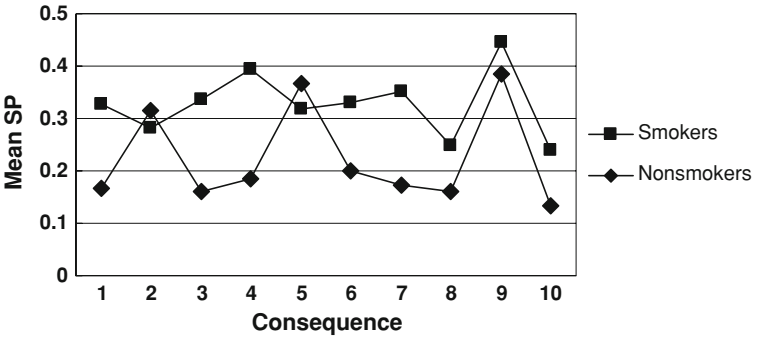

Fig. 3 Mean subjective probability for each of 10 consequences for 7-th grade smokers and nonsmokers

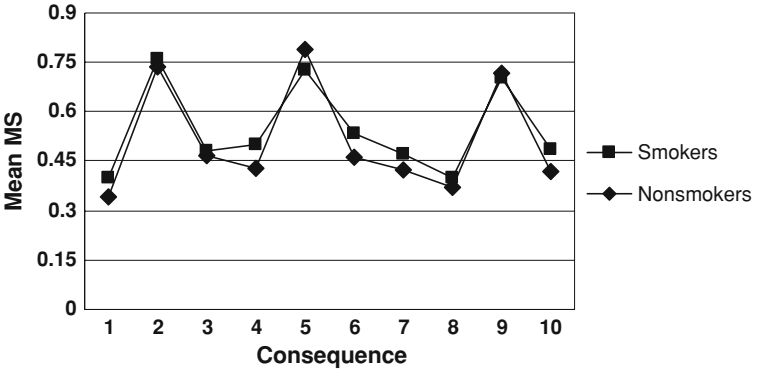

Fig. 4 Mean momentary salience for each of 10 consequences for 7-th grade smokers and nonsmokers

the same way. The lower products for nonsmokers result from their subjective values for the consequences being consistently lower.

Subjective probabilities and momentary saliencies are shown in Figs. 3 and 4. Smokers think most of the consequences are more likely to occur. Although the saliencies differ considerably across consequences, smoking status does not affect them.

3 Everyday decision making

Initiation, whether of drug use, a health program, or a marriage, is a one-shot decision, much like those considered in formal decision analyses. In contrast, most of the decisions people make in everyday life are repetitive and not seen as momentous. The decision maker may not even appreciate that a decision is occurring (Chapman and Niedermayer 2001; Wansink and Sobal 2007). To describe these decisions, we augment the theory by postulating a hierarchical structure that coordinates big and little decisions. Then we discuss the contribution of the environment.

4 Big and little decisions

A "big" decision sets a personal policy. That policy will in turn simplify a host of future "little" decisions. Examples of big decisions are becoming/not becoming a college student, committing/not committing to a personal relationship, or deciding upon a course of health-related behavior. Big decisions should be, and usually are, made deliberatively.

A little decision is an everyday decision, governed by a policy already in place. Little decisions determine the path of immediate action. They often need to be resolved immediately. Examples of little decisions that are governed by big decisions include going to versus cutting a particular class, responding to versus ignoring a flirtation this evening, or preparing a healthful meal versus going out for fast food. A prime motivation people have for making big decisions is that they know their impulsive decisions are prone to be untrustworthy, because insufficient consideration is given to consequences that should be important. If a policy is in place, one can fall back upon it to dictate the little decision. This strategy can be employed to avoid the damaging effects of choices based on visceral factors (Loewenstein 2005; Read and van Leeuwen 1998). While we all maintain a host of policies, people differ in their proclivity to establish them. Almost everyone has established policies for decisions regarding personal hygiene or eating specific foods, but some prefer to handle opportunities for social interaction or exercise on a case-by-case basis.

Little decisions are not necessarily inconsequential; running a yellow traffic light or picking up a partner in a bar can lead to a dramatic change in one's life. The decisions are little in the sense that one of the options is simply an implementation of the policy defined by the applicable big decision.[5] Choosing that default option requires scarcely any thought beyond determining which policy applies. No utility calculation is required for the default option implied by the policy, because that option inherits the MAU of the policy.

[5] Our hierarchical use of the words "big" and "little" differs considerably from that of Janis and Mann (1977), who apply the same terms to decisions. For them, a "big" decision addresses a global issue, whereas a "little" decision such as whether to marry or change jobs is important but affects a relatively small number of people. They are not concerned with such "minor" decisions as what to eat. In our view, the nested little decisions, far from being unimportant, can cumulatively have dramatic effects. Those cheeseburgers do add up.

Little decisions are also little in that their resulting actions usually generate very small changes in probability. The increment in the eventual likelihood of heart disease caused by eating one cheeseburger is infinitesimal. Big decisions, on the other hand, can generate sizable differences; the change in one's likelihood of eventually becoming obese if a healthy eating regimen is adopted (or abandoned) is appreciable. A big decision will generally have more consequences that get appreciable momentary salience than the little decisions nested under it.

Of course, people do make little decisions that violate their policies. Few policies have the status of commandments that are essentially never violated. A lapse can occur for a seemingly trivial reason. An anticipated consequence, such as the flavor of French fries, can take on high momentary salience via a cue such as aroma. That is, at least briefly, the MAU for the violation option (select an unhealthful meal tonight) exceeds the inherited MAU for the default option (select a healthful meal tonight) implied by the policy (eat healthfully). If dinner is decided upon during that moment, a lapse occurs.

The anticipated emotional consequences of a lapse play an important role in the little decisions. A consequence may be directly connected to the act—"Enjoy the taste" or "Elevate my mood"—or may reflect one's thoughts about the aftermath of the choice. Anticipated regret refers to the sense of loss one might expect to feel after missing out on the joys of the lapse. Anticipated regret increases MAU for the violation by entering the equation with a positive value; the more attractive the lapse, the more regret one might expect to feel upon forgoing it. The subjective probability of anticipated regret may grow over time; this increasing sense of deprivation inspires violation. In contrast, anticipated guilt refers to the reduced sense of self-worth that can be generated by surrendering to the temptation. Anticipated guilt reduces MAU by entering the equation for the violation with a negative value. Although Howard (1992) suggests that regret is merely a bad thought, anticipated emotions have been shown to play a significant role in determining choices (Mellers et al. 1999).

The indirect effect of lapses is especially important. A series of lapses may lead to a new big decision if the person has the insight that current policy is not governing practice. How many violations must be experienced before a person draws the inference that the policy decision has been overridden? People can fight temptation every day, occasionally yielding without necessarily abandoning the relevant policy. Policy collapse is a possible end state to the continued struggle (Marlatt and Donovan 2005). Collapse of the policy is referred to as *relapse* in the addiction literature. We view collapse as a more general phenomenon; one may abandon a policy by halting a healthful routine, such as an exercise regimen, as well as by actively reverting to an unhealthful practice. One might infer from a recent succession of tacos and pizza that a healthful diet is just not something sustainable. Someone reflecting on impending collapse may instead reaffirm the policy, attempting once again to make little decisions consistent with it.

One might eliminate the concept of the lapse by defining the policy as one of moderation, thereby allowing for occasional indulgence. Most people find it especially difficult to completely give up a previously well-established habit (Polivy and Herman 2002). In the food domain particularly, moderation is often recommended on the practical ground that people prefer a diet that permits a few unhealthful treats.

For health promotion, we think it is preferable to keep the negative connotation of a lapse. Temptation should be recognized; the feeling can serve as a signal that one might wish to reconsider the momentary saliencies. The guilt anticipated to follow a lapse can inspire the decision maker to choose a more healthful option. In practice, sanctioned moderate indulgence can quickly lead to policy collapse (Hill et al. 1988).

Our empirical work using the hierarchical model, in its infancy at present, has focused on lifestyle decisions, particularly diet. Here the goal is to show the connection between MAU and the daily choices an individual makes. MAU for the violation option should be larger on the occasions when that option was chosen, as compared to instances where the little decision was consistent with the policy.

5 The role of the environment

Two aspects of the environment are crucial to decision making. First, an option can only be chosen if is available and the decision maker is aware of its availability. If fast food were not sold relatively cheaply (Devine et al. 2007) and conveniently, there would be less obesity (Maddock 2004). As the delivery agent for consequences, the environment also includes internal elements such as metabolic and neural systems. Visceral drives and memories combine with opportunities offered by the external environment to inspire moments of decision.

Environments often provide many options, which can be either a blessing or a curse for the decision maker. A decision can be simplified by transforming a complex set of options to a series of yes–no questions (Edwards and Fasolo 2001). A person making a big decision will have a goal ("attain normal weight") and a view of the available options that might bring about that goal ("take nutrition classes," "adopt South Beach diet," "reject desserts," "hope/pray for weight loss"). People with particular preferences may try to engineer their environment so that it offers additional options. This involves another level of decision above what we have labeled the policy decision. For example, one might engage in a campaign urging a natural-foods retailer to set up shop nearby.

The second way the environment constrains decisions is via the packaging, the particular collection of consequences the environment attaches to an option. The subjective impact of such consequences as price, convenience of acquisition, social acceptability, and long-term effects determines the appeal of an option. People have personal theories about what options are available and about how the environment packages the consequences. These personal theories are not necessarily realistic.

Laboratory attempts to change the packaging, e.g., by attaching economic incentives to weight loss (Jeffery et al. 1993), have not been successful, probably because of what Thaler (1985) refers to as mental accounting. Food and weight belong together, but money goes in a different pocket. Another illustration that a theory of packaging dictates which consequences will be associated with a behavioral option is provided by Garcia et al.'s rats. The animals instantly learned to avoid flavors associated with radiation-induced digestive illness, but were much slower to learn to avoid visual or auditory stimuli with the same associations. They "knew" that stomach pain is supposed to stem from what is ingested rather than from sights or sounds.

6 Discussion

Is it plausible that people can do the complex mental arithmetic described in the MAU equation? Furthermore, is it reasonable for them to carry out these computations many times a day, for trivial decisions such as what to eat or selecting a seat on the bus as well as for momentous ones such as buying a house or choosing a mate? The use of an algebraic model to describe decision-making behavior does not mean that we impute mathematical expertise to the decision maker. We do not claim that actual calculations are done. Our perspective is that the decision maker does something analogous to the computations specified in the model equation. Utilities come to mind as if they were explicitly calculated using the MAU equation, just as a predator finds an optimal path toward moving prey as though using calculus (Pennings 2003). Hoffman (1960) refers to this kind of model as "paramorphic," conveying the idea of structural similarity.

A system for estimating the utility of a contemplated action might well utilize the kind of pre-wired program that Cosmides and Tooby (1994) propose evolution to have bestowed on animals. A mechanism that incorporates uncertainty and evaluates options would be quite advantageous for foraging or predation. When the hungry lioness stares back and forth at the wildebeest and the zebra, is she employing the MAU equation to decide what's for dinner? The mechanism may have appeared early in evolutionary terms. Darwin (1881) writes appreciatively of the decision-making capability of earthworms; Dill and Fraser (1997) describe decision making in another animal without a cortex. Although the algebra of utilities may seem complex, it is surely no more complex than the trigonometry that describes vision. Just as humans and other animals do not need to be taught to locate objects in space, so they do not require formal instruction to make decisions according to the MAU model. An implication of this view is that teaching people to follow the model explicitly is not likely to improve their decision making; the built-in mechanism is pretty good already. But we might be able to teach people to realize how momentary saliencies can deflect them from a well-planned course of action.

Perhaps the most valuable contribution of the descriptive MAU model is that it gives prominence to proximal elements that intrude at the moment of decision. Behavioral theories that incorporate expectancy notions (Weinstein 1993), such as the health belief model (Rosenstock 1974) and the theory of reasoned action and planned behavior (Ajzen 1991), feature the role of knowledge in forming intention. These theories imply that people in possession of correct, relevant information will make good decisions about what to do. This reasoning has led to many interventions that teach people how changes in behavior will improve their lives. We agree that knowledge is necessary; in the descriptive MAU model, subjective values and subjective probabilities encapsulate knowledge. Unfortunately, though, these knowledge-based interventions tend to be unsuccessful in the long run (Mann et al. 2007; Shiffman 2006); good intentions are usually insufficient to bring about lasting changes. Everyone already knows that cigarettes are bad, and that an apple is a more healthful dessert than a brownie. Interventions that address immediate influences, that can help to mitigate the temptations long enough for momentary saliencies to subside, may be the key to solving the problem of maintenance (Rothman 2000).

Developing such interventions for practical contexts will be challenging. For example, we have considered attaching to the refrigerator a cute little pig that oinks when the door is opened. The idea is to remind the dieter to reflect for a moment about the impending choice. Two potential drawbacks are that the dieter (a) can disconnect the pig and (b) might soon learn to ignore the message in the same way that smokers learn to ignore the warning labels on cigarette packs.

Capturing momentary saliencies presents another challenge to the researcher. The problem is that a transient feeling may vanish before we can measure it. We are experimenting with the use of Ecological Momentary Assessment (Stone and Shiffman 1994) technology to try to measure saliencies as closely as possible to the moments of decisions about food choices. An unresolved issue is whether merely answering the researcher's questions interferes with the recall process. Until Robin Hogarth's fanciful "Neurometer," an electronic device that will connect brain activity with thoughts, becomes available (see Sanfey et al. 2006), the validity of the self-reports is a matter of concern. The proof will be in whether the MAUs constructed from the reported parameters predict decisions. It may also prove effective to use model-based inference (Coombs et al. 1967) rather than asking people to report parameters directly, as illustrated by Edwards (1962) extraction of subjective probabilities from decisions and by functional measurement analyses of gambling choices (Anderson and Shanteau 1970; Weiss 2006).

We are optimistic that the hierarchical model will prove useful in understanding violations of other policies that people establish for themselves. For example, when couples marry, they make vows that are supposed to govern their conduct forever; yet, half the marriages in California do not last 5 years. Married folks are often tempted to make a little decision inconsistent with their vows, and the union may not survive the lapse. In a similar but even more sinister way, abusive husbands repeatedly proclaim both their affection and their resolve never to engage in domestic violence again. Unfortunately, a perceived provocation can reduce the momentary salience attached to anticipated regret and lead to a tragic little decision. Policy violation can also comprise an action not committed. Those of us who have pledged to faithfully follow an exercise regimen know how easy it is to manipulate saliencies that make MAU for not exercising exceed the inherited MAU for exercising—just for today.

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