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Irrational – at the moment

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In colloquial speech, referring to another person's decision as irrational means little more than that the speaker considers the choice foolish. Scientists have attempted to bring precision to the pejorative term by providing context-specific criteria. We join in that enterprise by offering a definition customized for everyday decisions.

In his groundbreaking presentation of the theory of decision making, Edwards (1954) argued that “economic man” is rational if he (1) can weakly order the expected results of his choices, and (2) chooses in such a way as to maximize something¹. Dawes (1988) echoes that definition, deeming a rational choice to be one based on the decision maker's current assets and the consequences of the choice, with the likelihood of a consequence obtaining evaluated according to probability theory.

Not everyone shares this goal-oriented perspective. Gigerenzer (2008), for example, discusses four perspectives on rationality. Broadening the scope beyond economic choices to general problem-solving, he advocates the study of “ecological rationality”, the examination of the fit between a stratagem and the environment in which it is employed. Ariely's (2010) entertaining paean to behavioral economics equates rationality with logic. In a volume focused upon thinking, Dawes (2001) presented a new definition, denoting irrational beliefs as those that involve self-contradictions. Irrational choices occur because the decision maker does not fully understand the various alternatives and thereby fails to appreciate a possible self-contradiction. Dawes's 21st-century definition abandons optimization and instead employs a consistency criterion.

A model-inspired definition of rationality

The definition we advance here is novel, drawing upon the earlier definitions but applicable specifically to everyday choices, the myriad decisions we all make repeatedly. Most of these choices do not have economic consequences – we choose what to ingest, whether to exercise, whom to spend time with. In these cases, the decision options always include multiple consequences. A prospective meal, for example, may offer possibilities related to sensory pleasure, to health, to expense, to social interaction, and the like. Some consequences may happen immediately, others in the future. According to the “descriptive multi-attribute utility model” (Weiss, Weiss, & Edwards, 2009, 2010), such choices are determined by evaluating the decision options and choosing the one with the highest utility. The descriptive model thus incorporates the optimization goal of the classical subjective expected utility model, but departs by incorporating an additional parameter. *Momentary salience* captures the degree of attention paid to the various possible consequences at the

¹We apologize for the sexist language, which was used in the original presentation. The evolution of Edwards's writing style is discussed on page xi of Weiss and Weiss (2009).

moment of decision. Exceptions abound, but in general, momentary salience is small for faraway outcomes and large for those in front of us.

The hierarchical descriptive multi-attribute model

Whenever a moment of decision arises, consequences are evaluated using three parameters in accord with the expression:

$$\text{Multi-Attribute Utility (MAU)} = \sum_j SV_j \bullet SP_j \bullet MS_j$$

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. Consequences may be tangible, whether monetary or not, or they may be emotional. Accordingly we view this dimension as having units that might as well be given an arbitrary name such as utiles (Mosteller & Nogee, 1951). The embedded assumption is that disparate types of consequences are commensurable and can be traded off against one another. Values are always assessed at the moment of decision, even though the consequence may be experienced later. For example, in considering whether to go on a date, the decision maker will attach values to anticipated social consequences. The experienced consequences might not coincide with those anticipations. Awareness of such possibilities can complicate the decision, adding anticipated consequences of elation and disappointment to the MAU computation.

(2) Subjective probability (SP) is the perceived likelihood that the anticipated 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. 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 salencies, we incorporate the intuition that some decision options evoke a greater number of important consequences than do others.

Because they are derived from the mathematical construct of expected value, traditional formulations of subjective utility include only two parameters. The only weighting needed in an expected value computation is for probability. Adding momentary salience allows the descriptive model to account in a natural, parsimonious way for some of the classic issues that have inspired new theories. Losses receive more attention than corresponding gains, immediate pleasures are more salient than penalties that might ensue later. In proposing the new parameter, we attempt to capture the notion that some consequences, even those with extreme values such as imminent death, may be ignored in a decision. The father who attempts to rescue his child from a raging fire does not weigh the value of his own life against that of the child; he attends only to the consequence of losing the child. Of course, the father could engage in a more extensive computation, and his decision might be quite different. Less dramatically, many of us ignore the calories in birthday cake or menu prices while on vacation.

The MS parameter also deflects the primary objection to the use of a utility model as descriptive. Simon (1982) held that a decision maker would require omniscience to appreciate all of the consequences attached to an option, and would also need a superb computer to integrate them correctly. Note that if all consequences receive full attention

($MS_j = 1$ for all values of j), the model reduces to the classical subjective expected utility (SEU) model. Although Simon did not use our terminology, it would seem that he considered the possibility of full attention to all consequences feasible only for the simplest decisions, and thus rejected SEU as a potentially descriptive general theory of decision-making.

Similarly, Gigerenzer et al. (1999) observe that very few consequences, perhaps as few as one, are considered when some choices are made. The descriptive model handles the problem of computing power by acknowledging that only a limited number of consequences receive appreciable salience. With unconsidered consequences receiving a salience of zero, they do not affect the product, and thereby do not contribute to the utility of the option.

Gigerenzer (2008) decries the “as-if” nature of models that include maximization as their cornerstones, preferring to seek simpler heuristics that can describe the behavior. Algebraic models are always paramorphic (Hoffman, 1960); we do not presume actual calculations take place while a person decides what to do. We do think there is an inbuilt mechanism, provided via evolution to humans and other animals, that in effect multiplies experientially generated parameters, then sums products to yield expectancies (Weiss, Weiss, and Edwards, 2010). The computations are no more available to awareness, and are no more complex, than are the trigonometric calculations by which these organisms locate objects in space. Identifying the neural basis of the posited mechanism is a task for the future.

Hierarchical structure

For everyday choices, the decision maker usually employs the model hierarchically. *Big decisions* set policies intended to guide future little decisions. Most folks have many policies in place. One might resolve to favor or avoid certain foods or drinks, to drive in a particular manner, to treat one's spouse or children in a particular way. These policies are usually determined after due consideration, during which all of the consequences with appreciable likelihood are given appropriate salience.

A policy is usually implemented to promote a goal, which is one of the consequences of the big decision. A precipitating event such as a physician's recommendation or an overheard derisory comment might provide the impetus for making the big decision to shun restaurants, with the goal of losing ten pounds. Other consequences are also attached to that big decision. Some are positive, such as saving money and wearing casual clothes while eating. Others are negative, such as having to shop, cook, and wash dishes, along with enduring the mediocre taste of food prepared by an amateur.

Midstream, a policy might be abandoned if it were seen as ineffective toward achieving the goal, or if the decision maker belatedly realized that the goal had been over-valued (Loewenstein & Schkade, 1999). If the policy survived until the ten pounds vanished, the weight-loss consequence would lose its value and reassessment would be in order. In principle, some goals are lifelong, such as enjoying a happy marriage or being a good citizen. Lifelong goals generate a variety of policies that would be expected to be maintained permanently.

When a policy gets set in place (“considering everything, I will not eat cookies”) it obviates the need to think hard about decision opportunities that may arise repeatedly. Accordingly, the daily *little decisions* (“should I eat the cookie that is available to me right now?”) nested under a particular big decision can be made quickly. The little decisions often simply mirror the applicable big decision, in effect inheriting utilities, but occasionally deviate from the chosen path. Little decisions are subject to fleeting influences that disrupt the distribution of salencies, which in turn alter utilities. A reduced number of consequences, perhaps as few

as one, may receive all of the attention when the decision occurs. The adolescent who knows all about the dangers of drugs, who would usually just say no, is overwhelmed by the attractive peer making the offer and thinks only of the joy ahead. The dieter innocuously shopping in the mall is seduced by the aroma emanating from the cookie stand. The policy of avoiding restaurants is challenged by social pressure, which highlights negative consequences such as the feeling of isolation if I decline to join my friends and being viewed as a cheapskate.

When we speak of big decisions, we do not refer to momentousness or to scope. The hierarchical structure is the same whether the decisions are about foreign affairs, extra-marital affairs, or cookies. Big decisions are merely those that govern nested future little decisions. The hierarchical structure applies to either broad (“don’t eat meat”) or narrow (“don’t eat veal”) policies. The purpose of the policy is to provide guidance when a relevant little decision opportunity comes along. The evolution of policies and their logical interconnections are topics that we believe to have important implications for research on health and on happiness.

A big decision will have a large impact because of its potential cumulative effect. While consuming an individual cookie will have miniscule impact on appearance or health, the result of a policy to reject all cookies can be significant. A more general policy, say one that calls for rejecting all high-fat foods, might have even greater impact. However, the broad policy may be more readily violated because more temptations will arise. Repeated violations threaten policy collapse, because the decision maker decides the policy is unrealistic.

Irrational choices

Some people are more resolute than others, but some temptations are especially compelling. It is the human condition to violate our policies. Such violations are what we propose to call irrational choices. A rational choice is one that is consistent with the policy in place. Thus our definition incorporates Dawes’s notion of contradiction, melding that notion with Edwards’s principle of maximization. When a decision maker violates, it is because the utility of the chosen option is higher than that of the alternative – at the moment. The parameters for the little decision differ from those used when the big decision was made. Right now, when I smell the cookie, its utility is very high, because the value attached to the sensory consequence is multiplied by a high momentary salience. We all fall off our personal wagons occasionally because saliencies are labile, driven by current circumstances. Sexual arousal is notorious for its impact on ordinary caution (Ariely & Loewenstein, 2006). Yielding makes sense now, although there may be regret later. When the regret consequence is foreseeable, it can be incorporated into the utility equation as well. If anticipated regret receives sufficient salience at the moment of decision, it can militate against an irrational choice. Subjective values may also change over time, although they are likely to evolve systematically.

In an economic context, a choice we would deem irrational would also be considered irrational according to Edwards’s definition. The appropriate policy for a subject in a gambling study (sometimes suggested explicitly by the researcher) is to choose the option that would bring in more money in the long run. Little decisions violating that policy would correspond to sub-optimal choices, and would therefore be considered irrational in the classical sense.

Justification of the new definition

From a linguistic perspective, we would like the term “irrational” to be more than a synonym for “illogical”; the word should convey something unique. An appealing aspect of the model-inspired definition is that it is individualized. I cannot label your choice irrational because I think it is dangerous, or will be costly in the long run, or merely because I disagree with your view of the potential gains and losses. The MAU equation allows for a decision maker to choose an option that most observers would consider foolish. Peculiar choices stem from idiosyncratic, possibly evanescent parameters. We want the definition of rationality to accommodate the idea that goals and circumstances can vary widely across people. Accordingly, a seemingly foolish choice is not inherently irrational according to our definition. Only when the choice is compared to the decision maker’s policy can rationality be assessed; it is a within-person issue.

For the decision maker, recognizing irrationality can lead to change, which can be a positive step. If the realization strikes that irrational choices are occurring often, that may be upsetting. The dissonance can be reduced either by enforcing the policy more rigorously, or by changing the policy. Sometimes a policy may have arisen implicitly, without formal thought, or may have been recommended by someone else. The decision maker realizes that establishing a new policy incorporating carefully considered personal parameters would be worthwhile.

Policies suggested by others need not be fully embraced. When my doctor, accountant, or spouse recommends a course of action, the suggestion is based on what the recommender thinks my utilities ought to be. It might seem wise for me to adopt those vicarious utilities, particularly if I have paid for the advice; but lack of wisdom is not the same as irrationality. Nonadherence to the suggested regimen can result from the mismatch in utilities; we do not view that as an irrational choice. According to the present definition, nonadherence is irrational only if the decision maker has previously made the big decision to comply with the recommendation.

Because people hold onto many policies simultaneously, the challenge offered by some decision opportunities is to determine which policy governs the current problem. These conflict situations are particularly uncomfortable when well-practiced policies apply. The other side of the coin is an opportunity that appears to be truly novel, where no policy fits. If no single policy dictates the choice, the decision needs to be treated as new, without reference to a policy. In such cases, we would be reluctant to characterize any decision as irrational.

Our construct of rationality is neutral with respect to whether the choices are likely to serve the decision maker well. Sometimes only time will tell. The mothers of the authors of this paper died of different cancers eventually attributed to maintenance of lifestyle choices first made in late adolescence. In both cases, at the time the women formulated their policies, physicians were positive regarding the health implications of their choice. For many years, no adverse effects appeared, and (rationally) following the policies brought considerable enjoyment. When new knowledge came to light, the medical establishment changed its tune; but our moms continued to follow their policies. The inconsistent advice led them to cast doubt on the credibility of the doctors; moreover, they really enjoyed what was only now being deemed a vice. The smoker’s policy was labeled an addiction, while the other was merely a food preference. Ultimately, symptoms appeared and diagnoses were issued. The policies were changed overnight, but it was too late for the women to be saved.

Assessing rationality

Edwards's definition provides an unequivocal standard against which to judge economic decisions; one should try to amass as much money as possible. Accordingly, someone who chooses the option that rates to win less or lose more can be deemed to have made a poor decision, and thus the choice is subject to being labeled an irrational one. Much of the research on gambling is designed to expose this type of irrationality.

Everyday decisions are less easily categorized as sound or unsound. A fundamental difference is that everyday decisions lack an essential characteristic of economic decisions, in that more is not always better. One (cookie, drink, hour of exercise, spouse) may be better than none, but two are not necessarily better than one. Coombs (1950) clarified this scaling issue by positing that individuals have idiosyncratic ideal points on each continuum. Although one might attempt to redefine optimization in terms of minimizing distances from the ideal points, determining the degree of suboptimality for an actual decision would be an arduous process. Furthermore, the ideal point is not necessarily fixed. Cookies are more valuable when I am hungry than when I am not. As a practical matter, it is difficult to say that someone else's everyday choice is irrational in the economic sense because the ideal points are not known to the observer. A person gambling for cookies (rather than for money) could hardly be called irrational for preferring one cookie to two.

Another important distinction between everyday decisions and economic decisions, particularly as the latter are studied in the laboratory, is in the specification of the applicable consequences. For gambles and other games, the full list of possibilities is made available to the decision maker before the choice is elicited. For a purchase of, say, a house, disclosure of its condition and detailing of the financial terms is the norm. In contrast, the consequences of an everyday choice such as forming a new social relationship or eating a new dish may be vague at the time of decision. The options package as conceived by the decision maker (Weiss, Weiss, and Edwards, 2010) serves as the basis of the decision, but an external observer would have difficulty determining the contents of the package.

To circumvent the missing information, an observer might simply assume that we all have policies in common or that a sensible policy is obvious in many situations. The rationality of someone else's everyday decisions could then be judged according to whether the observed little decision is consistent with the imputed policy. Potential emotional empathy gaps (Van Boven & Loewenstein, 2003) between observer and actor are not an issue because this evaluation of rationality depends solely upon consistency. It is tempting to charge the obese person gorging at the buffet or the teenager engaging in risky sex with behaving irrationally. The casual, and often accurate, judgment would be that these actors have violated their health-related policies because temptation inspired new little decisions.

However, it is also possible that the observer lacks insight regarding applicable policies (Geronimus, 2003). The buffet lover may be saving money, expecting to pay for only one meal that day. The horny adolescent may think that adults exaggerate the risks. The under-preparedness for the 9/11 attacks illustrates the danger in assuming universal values. The attacks were the result of decisions that were rational from the perspective of Al Qaeda members, but not from that of the Americans defending their homeland.

Promoting rationality

The descriptive model provides a theoretical framework that may clarify the task of those who would influence everyday decisions. All too common is the belief that if only a decision maker had the appropriate knowledge, a proper intention would be formed that would inevitably lead to the desired choice. This is the philosophy that underlies educational

interventions intended to promote exercise and healthy eating, to stop teens from taking drugs, to curtail smoking.

From the perspective of our theory, knowledge determines the options package and influences subjective values and probabilities. Knowledge is necessary to set a sound policy, but not sufficient to guarantee subsequent adherence. Momentary salencies that affect the little decision are largely immune to knowledge, and thus irrational choices occur. When the dieter lapses, it is not because she is unaware that yogurt is more healthful than a cheeseburger. When the would-be quitter lights up, it is not because he has forgotten that cigarettes cause disease.

Tactics that attend to momentary salencies ease the path to rational choices. In a dieter's utopia, the environment would be engineered to minimize temptation. Restaurants would prominently display beautiful salads, suppress aromas from the fryer, and hide the dessert cart. Servings would be small and so would plates (Wansink & Cheney, 2005). In the real world, restaurant managers are aware that temptation increases cash flow. The decision maker may counter temptation by routinely introducing a delay prior to ordering. Recording the meal, with either a paper or electronic food journal, can serve to focus concentration on the full set of consequences attached to the choices. At the same time, the delay allows salencies to shift.

An open question is whether a new policy that calls for small changes is easier to adhere to than one that calls for large changes. Suppose a couch potato is advised that exercising daily will yield significant health benefits. Is he better off choosing to exercise at first three times a week, then adding more days, or immediately starting with the target of exercising every day? One might expect fewer violations with a policy that imposes less radical change, so it might be that the gradual approach is less likely to generate a collapsed policy. However, it is also possible that the grand leap is more effective because the daily dose is easier to build into a regular routine.

Our framework highlights the value of having policies in place, and is thereby compatible with the implementation intention approach to self-control advocated by Gollwitzer (1999). Doing the decision calculations in advance is particularly valuable in emergencies. When a decision is required immediately, some consequences may receive inappropriate salencies. A Californian needs a policy for coping with an earthquake just as professional first responders need to have them for handling fires or floods. A rational decision – one that follows a carefully considered policy – is more likely to preserve what is truly valuable than a decision made on the fly. We speculate that examining a person's policies would yield insights comparable to those gained from personality tests.

Discussion

In our view, decision making research took an unfortunate turn with the presumption that studies of gambles would yield insights that generalized beyond, well, gambles. When Edwards (1954) entitled his seminal paper “The Theory of Decision Making”, the die was cast. Edwards drew inspiration from von Neumann and Morgenstern (1944), who aptly entitled their volume “The Theory of Games and Economic Behavior”. Indeed, gambles and purchases have much in common, with a key feature being that information about possible outcomes is provided to the decision maker in both cases. The options package is well-specified, although a decision maker may have trouble remembering or integrating the information. Uncertainty is tied to probabilistic aspects of the situation. Inferior choices can be attributed to deficient cognitive performance. Accordingly, if an observer wishes to be pejorative by calling a poor choice irrational, the term has some justification.

von Neumann and Morgenstern were profoundly wise to restrict their target. The analysis of everyday decisions is much more complicated. One must unwrap the options package; the decision maker has to identify the relevant consequences attached to each choice. In choosing what to ingest, whom to interact with, or whether to exercise, not only must one contend with whether a probabilistically specified consequence will occur; but also, there is the matter of envisioning the consequences themselves. Additionally, momentary salencies, which are attached to every consequence, can fluctuate radically with context.

Subjective values involved in everyday decisions may cycle with somatic states, can reverse with new technological developments or information, can change with social pressure. People are aware that values will change over time (Loewenstein, O'Donoghue, & Rabin, 2003). They can correctly anticipate the direction of the change, though they underestimate how much their tastes will change in the future. A puzzle for the "projection bias" perspective, as these authors acknowledge, is why people do not learn from their experiences in misestimating. The current authors often shop for food after work, although we realize that going to the supermarket while hungry can yield a cart stuffed with unhealthful choices. Despite that knowledge, we occasionally overbuy and misbuy². As a matter of theory, we prefer to attribute our errors not to misjudgment of our future appetite, but instead account for the spree via increased momentary salencies for anticipated flavors. The numerous temptations laid before us by sophisticated merchants overwhelm our resolve and we behave irrationally³. Nothing analogous happens when we go to the bank when low on cash.

A classic observation with far-reaching economic implications is that a deferred amount of money is worth less than if it were received immediately. However, intertemporal choices not involving money are less predictable, in that they do not necessarily follow the usual discounting patterns. To be sure, positive consequences of some everyday decisions are preferred immediately. If thirsty, I prefer to have a drink now rather than later. In addition, experience has taught us that promises may be unfulfilled. Accordingly, the subjective probability attached to a consequence expected immediately (and therefore the utility of the option) will usually be higher than if delivery is delayed. Then again, postponement can work in just the opposite way, enhancing the value of a positive experience. Dessert (or romance) may be preferred a few hours after dinner rather than immediately. On the negative side, one may prefer to get the root canal over with rather than worry for weeks. Unlike the value of money, these experiences do not persist.

Games and economic behavior remain interesting topics, but we believe that studying them will not extend our understanding of lifestyle decisions, of social choices, of personal interactions. Gambles are a poor metaphor for the non-economic decisions we make many times a day. Raising the stakes may make laboratory gambles more engaging, but does not alter their character.

Money is but one of the things people value. Although money can be exchanged for many of the others, its fungibility makes it unique. Everyday decisions need to be studied in their own right⁴. We find it frustrating that authors reporting gambling studies often pepper the

²The second author is more likely than the first to commit these errors.

³Not coincidentally, if we shop together, we are much less likely to violate than either of us is when shopping alone. Momentary salencies can be altered by caustic remarks. It is not apparent how an explanation based on projection bias accommodates the disparity between individual and joint purchasing.

⁴Although they favored using money as the stimulus, Abdellaoui, Attema, and Bleichrodt (2009) drew a similar distinction. Economists were advised to avoid the messiness brought in by "anticipation, dread, savouring and self-control". We agree there is much to learn from studying behavior in a vacuum; but just as in physics, behavior in "the wild" (Camerer, Babcock, Loewenstein, & Thaler, 1997) is also of interest - for us, of primary interest.

introduction with analogies to everyday decisions. We suggest that if researchers want to understand real-life decision making, they would be well-advised to stop playing games.

References

- Abdellaoui M, Attema AE, Bleichrodt H. Intertemporal tradeoffs for gains and losses: An experimental measurement of discounted utility. *The Economic Journal*. 2009; 120:845–866.
- Ariely, D. *The upside of irrationality: The unexpected benefits of defying logic*. Harper; New York: 2010.
- Ariely D, Loewenstein G. The heat of the moment: The effect of sexual arousal on sexual decision making. *Journal of Behavioral Decision Making*. 2006; 19:87–98.
- Camerer C, Babcock L, Loewenstein G, Thaler RH. Labor supply of New York cabdrivers: One day at a time. *Quarterly Journal of Economics*. 1997; 112:407–442.
- Coombs C. Psychological scaling without a unit of measurement. *Psychological Review*. 1950; 57:145–158. [PubMed: 15417683]
- Dawes, RM. *Rational choice in an uncertain world*. Harcourt Brace Jovanovich; San Diego: 1988.
- Dawes, RM. *Everyday irrationality*. Westview Press; Boulder, CO: 2001.
- Edwards W. The theory of decision making. *Psychological Bulletin*, 1954. 1954; 51:380–417.
- Geronimus AT. Damned if you do: Culture, identity, privilege, and teenage childbearing in the United States. *Social Science and Medicine*. 2003; 57:881–893. [PubMed: 12850113]
- Gigerenzer, G. *Rationality for mortals*. Oxford University Press; New York: 2008.
- Gigerenzer, G.; Todd, PM.; ABC Research Group. *Simple heuristics that make us smart*. Oxford University Press; New York: 1999.
- Gollwitzer PM. Implementation intentions: Strong effects of simple plans. *American Psychologist*. 1999; 54:493–503.
- Hoffman P. The paramorphic representation of clinical judgment. *Psychological Bulletin*. 1960; 57:116–131. [PubMed: 14402414]
- Loewenstein G, O'Donoghue T, Rabin M. Projection bias in predicting future utility. *Quarterly Journal of Economics*. 2003; 118:1209–1248.
- Loewenstein, G.; Schkade, D. Wouldn't it be nice? Predicting future feelings. In: Kahneman, D.; Diener, E.; Schwartz, N., editors. *Well-being: The foundations of hedonic psychology*. Russell Sage Foundation; New York: 1999. p. 85-105.
- Mosteller F, Nogee P. An experimental measure of utility. *Journal of Political Economy*. 1951; 59:371–404.
- Simon, H. *Models of bounded rationality*. MIT Press; Cambridge, MA: 1982.
- Van Boven L, Loewenstein G. Social projection of transient visceral feelings. *Personality and Social Psychology Bulletin*. 2003; 29:1159–1168. [PubMed: 15189611]
- von Neumann, J.; Morgenstern, O. *Theory of games and economic behavior*. Princeton University Press; Princeton, NJ: 1944.
- Wansink B, Cheney MM. Super bowls: Serving bowl size and food consumption. *Journal of the American Medical Association*. 2005; 293:1727–1728. [PubMed: 15827310]
- Weiss, JW.; Weiss, DJ., editors. *A science of decision making: The legacy of Ward Edwards*. Oxford University Press; New York: 2009.
- Weiss, JW.; Weiss, DJ.; Edwards, W. Big decisions, little decisions: The hierarchy of everyday life. In: Weiss, JW.; Weiss, DJ., editors. *A science of decision making: The legacy of Ward Edwards*. Oxford University Press; New York: 2009. p. 451-460.
- Weiss JW, Weiss DJ, Edwards W. A descriptive multi-attribute utility model for everyday decisions. *Theory and Decision*. 2010; 68:101–114.